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Sharratt et al.

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(45) **Date of Patent:** **Jan. 26, 2016**

(54) **REPEL ASSEMBLY AND METHOD**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(22) Filed: **Oct. 22, 2014**

(65) **Prior Publication Data**

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Related U.S. Application Data

(62) Division of application No. 13/929,173, filed on Jun. 27, 2013, now Pat. No. 8,887,353.

(60) Provisional application No. 61/798,803, filed on Mar. 15, 2013, provisional application No. 61/666,419, filed on Jun. 29, 2012.

(51) **Int. Cl.**
B60B 33/00 (2006.01)
B62B 17/00 (2006.01)

(Continued)

(52) **U.S. Cl.**
CPC **B62B 17/00** (2013.01); **A47B 91/06** (2013.01); **B62B 15/00** (2013.01); **A47B 2091/063** (2013.01); **Y10T 16/209** (2015.01); **Y10T 16/216** (2015.01)

(58) **Field of Classification Search**
CPC B60B 33/00; B60B 2033/0034; B60B 2900/5112; B65G 7/02; A47B 91/12; A47B 91/14; A47B 91/16; A47B 91/06; A47B 91/066; A47B 2091/063; A61H 3/0288;

A61H 3/068; Y10T 16/207; Y10T 16/209; Y10T 16/211; Y10T 16/21; Y10T 16/216
See application file for complete search history.

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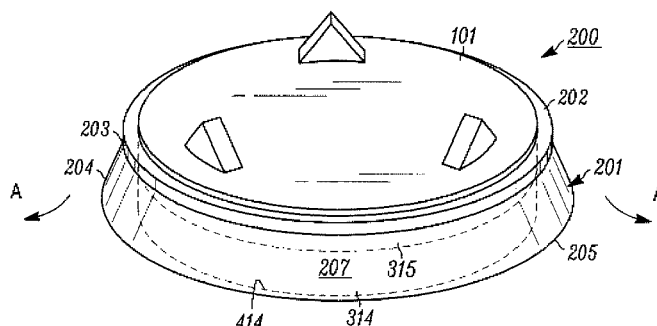
Primary Examiner — Chuck Mah

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(57) **ABSTRACT**

A repel assembly and method includes an engagement surface having an adhesive plane for securing to an object, a plurality of attachment spikes extending from the engagement surface at an angle transverse to the adhesive plane and a transport surface for supporting a fixture coupled to the plurality of attachment spikes, the fixture being positioned between the engagement surface and the transport surface. The repel assembly further includes an annular ring having an upper and lower ring coupled to the repel assembly, the lower ring having first and second ends spaced by a wiper body such that the annular ring repels debris from contacting and/or collecting on the transport surface.

25 Claims, 27 Drawing Sheets



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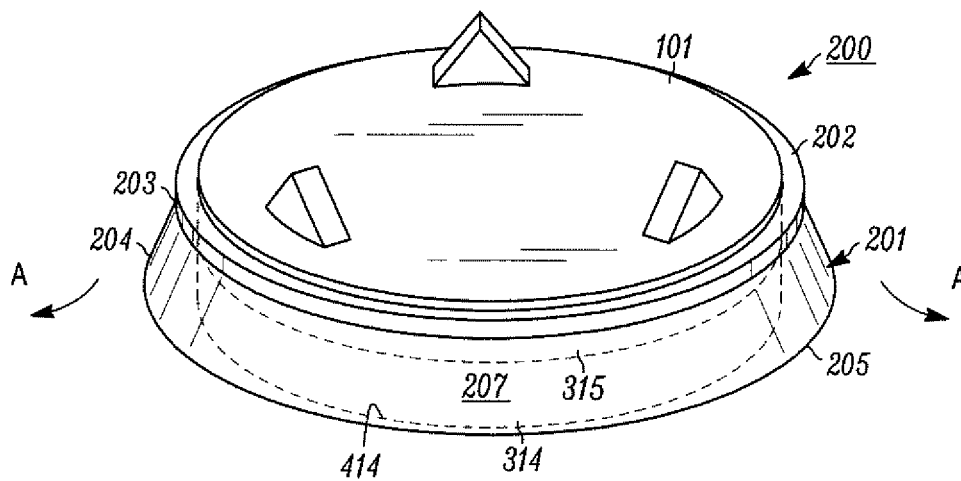


FIG. 1

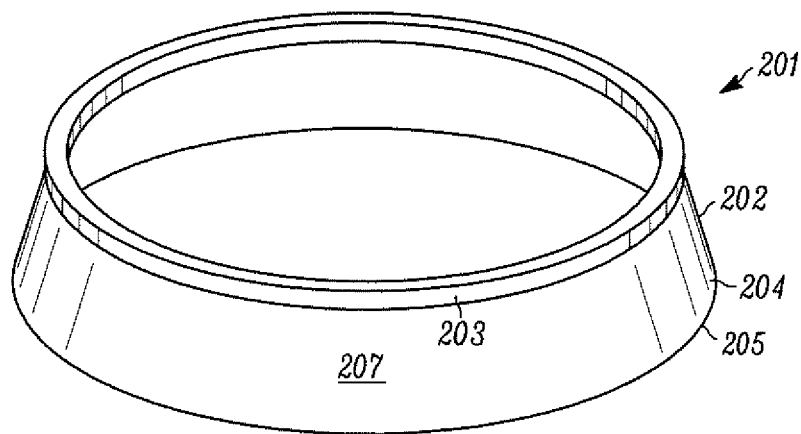


FIG. 1A

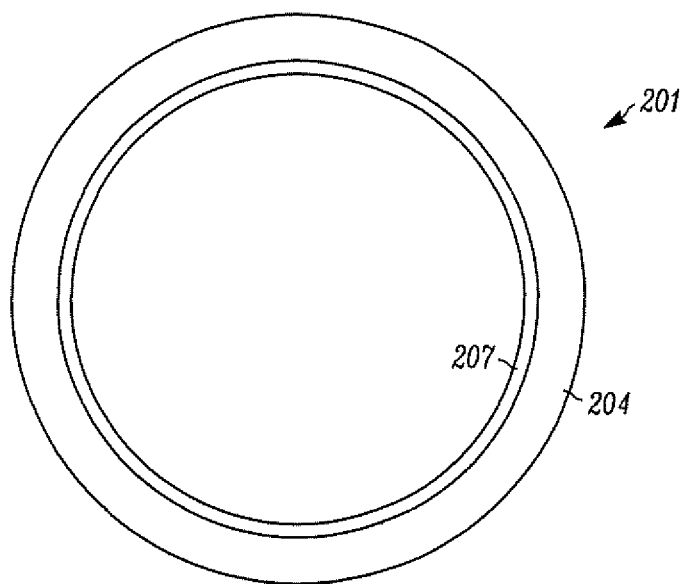


FIG. 1B

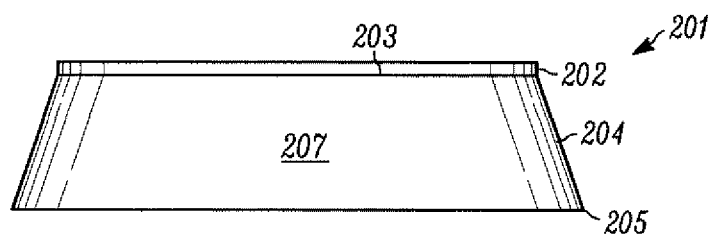


FIG. 1C

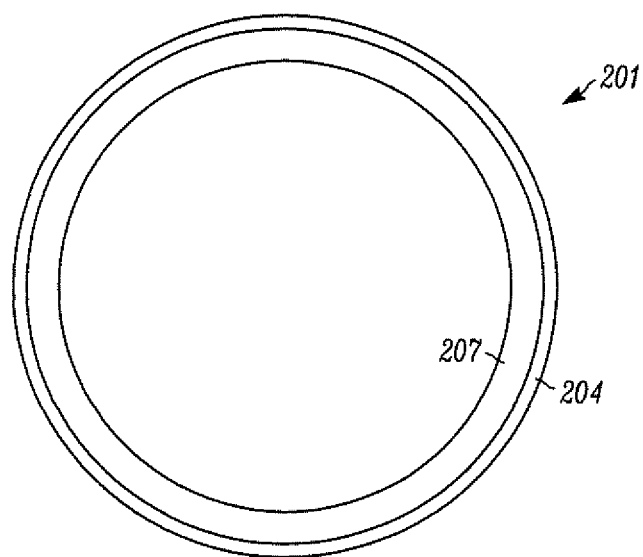


FIG. 1D

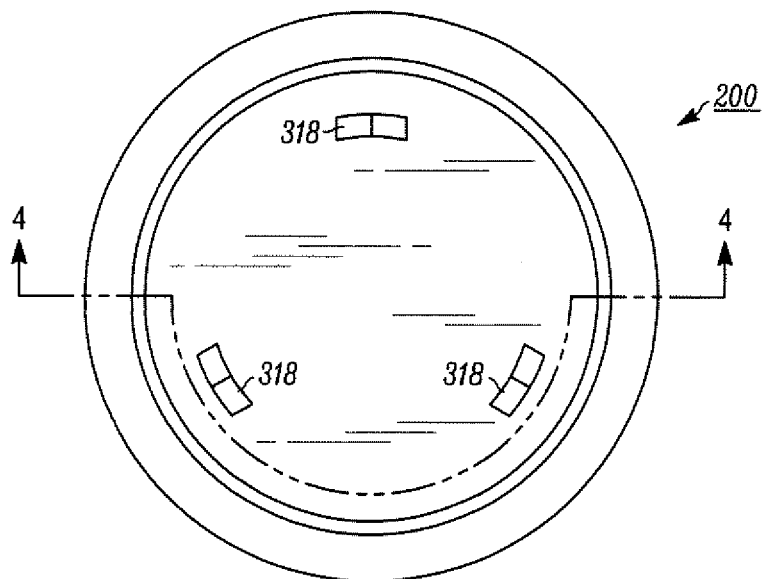


FIG. 2

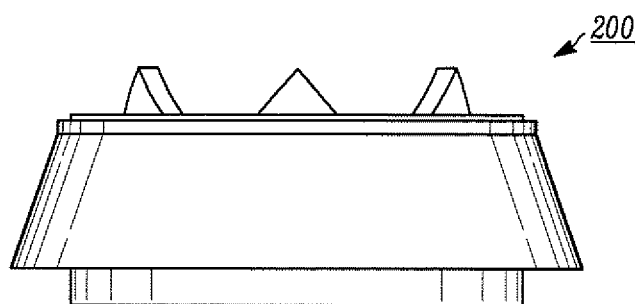


FIG. 3

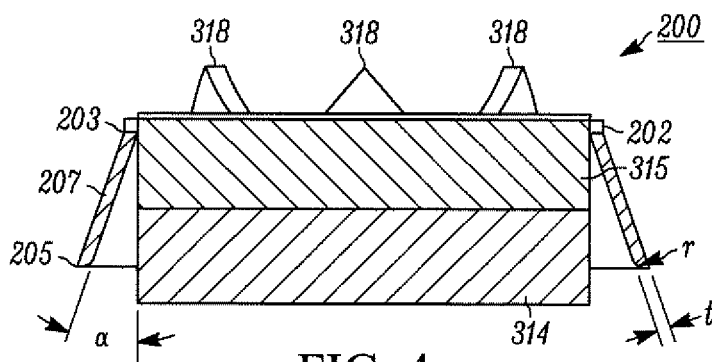


FIG. 4

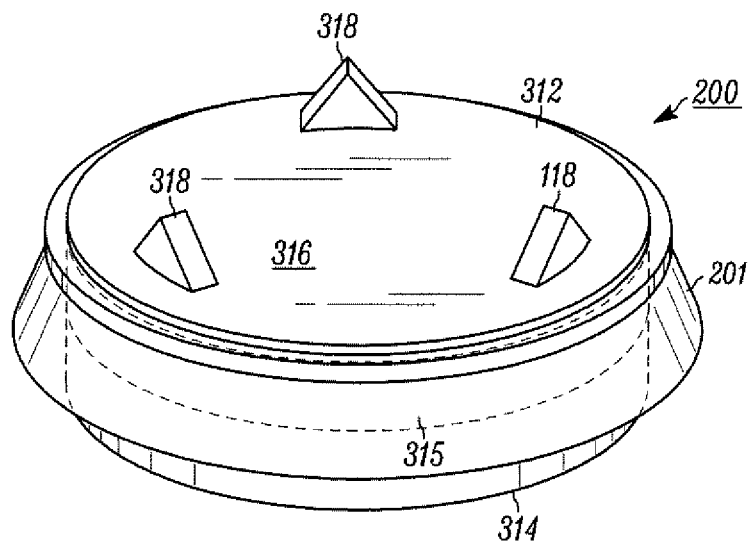


FIG. 5

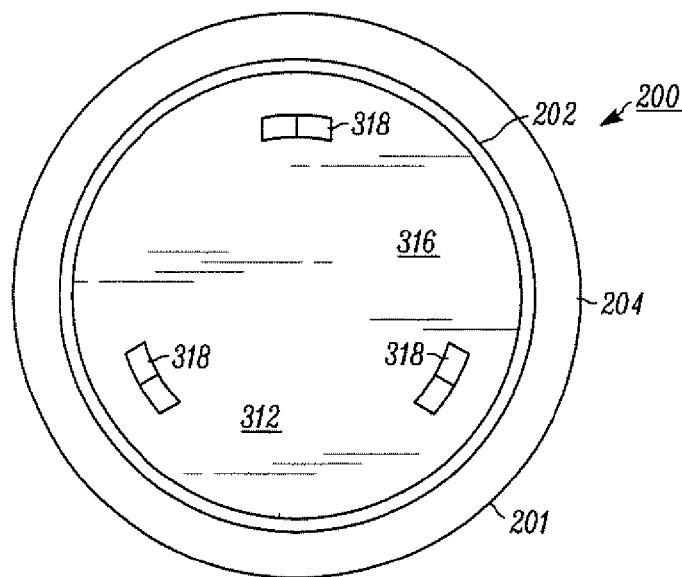


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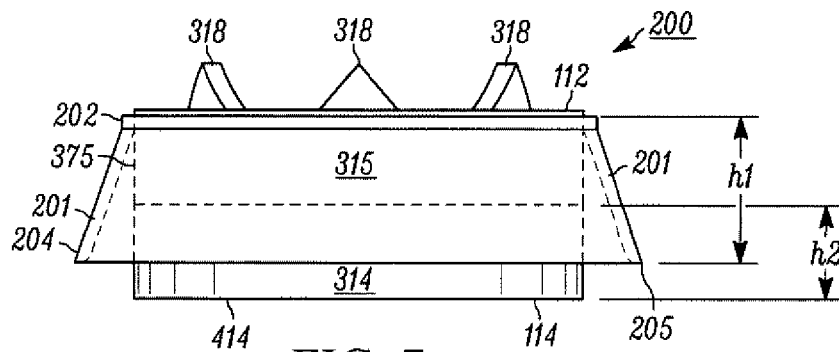


FIG. 7

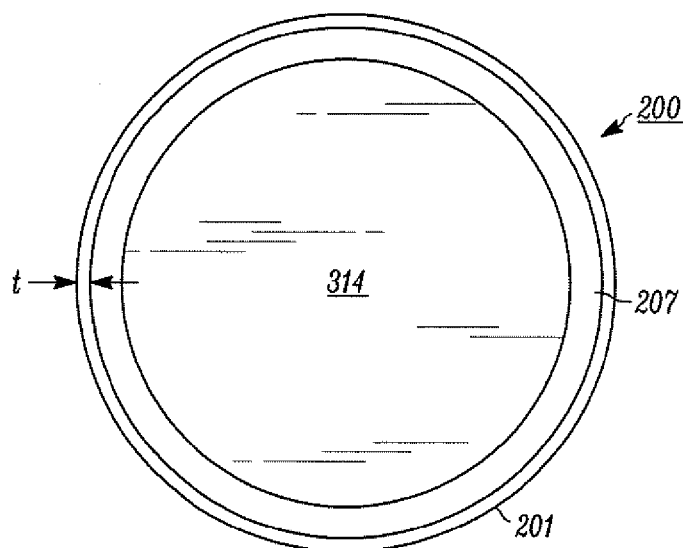


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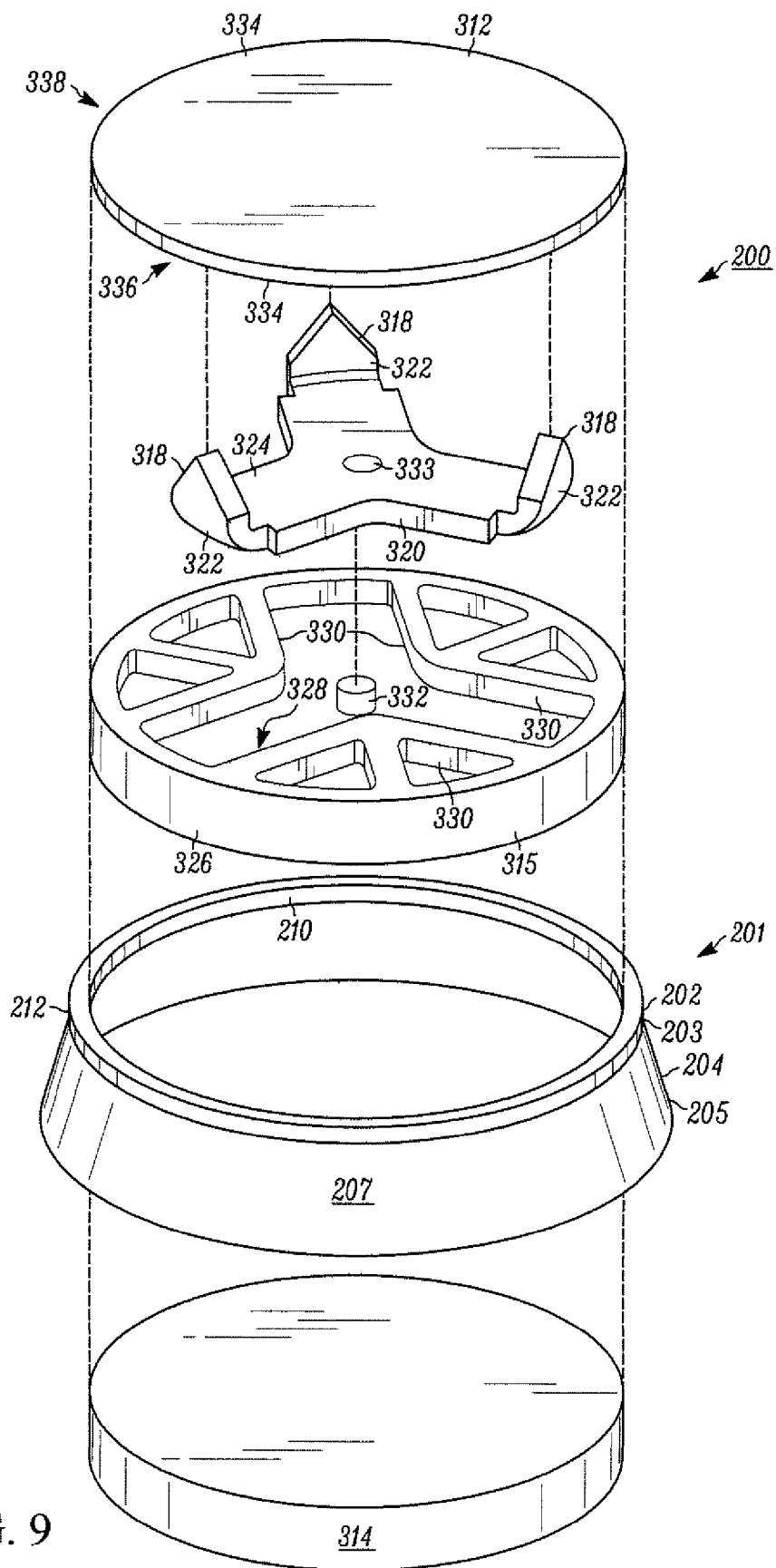


FIG. 9

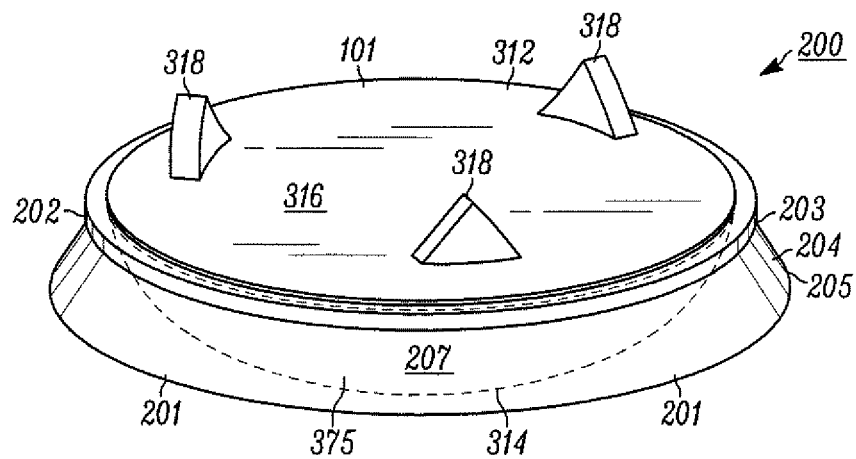


FIG. 10

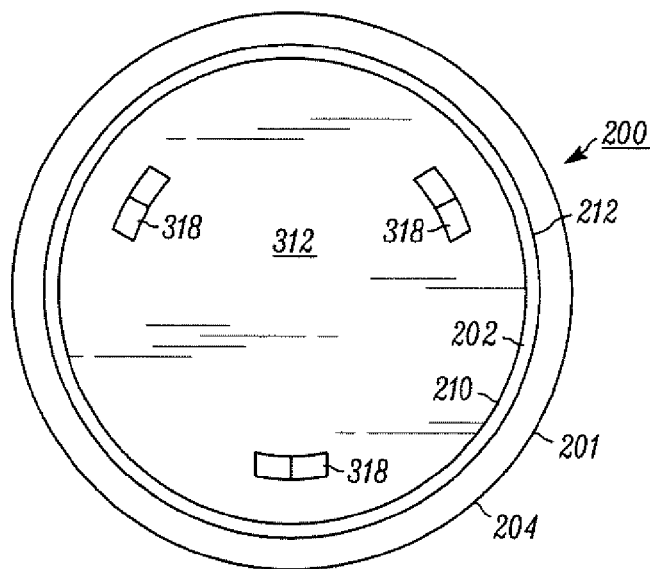


FIG. 11

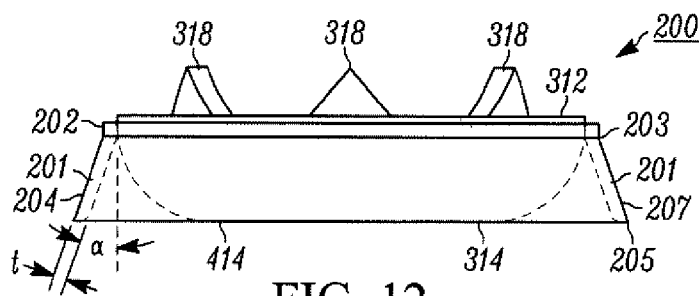


FIG. 12

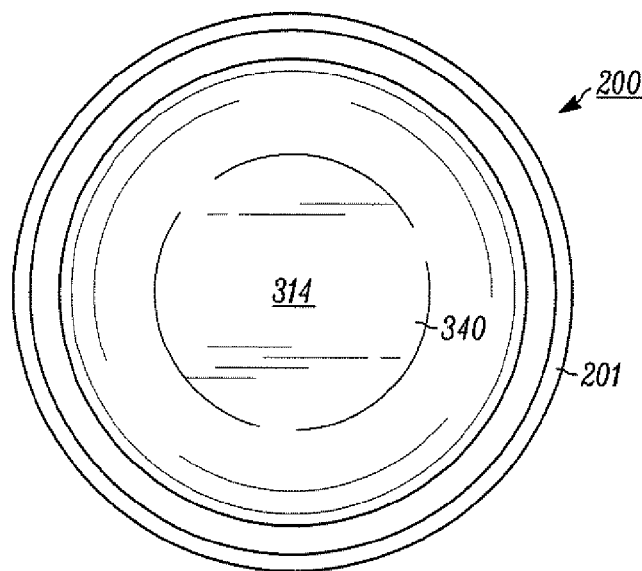


FIG. 13

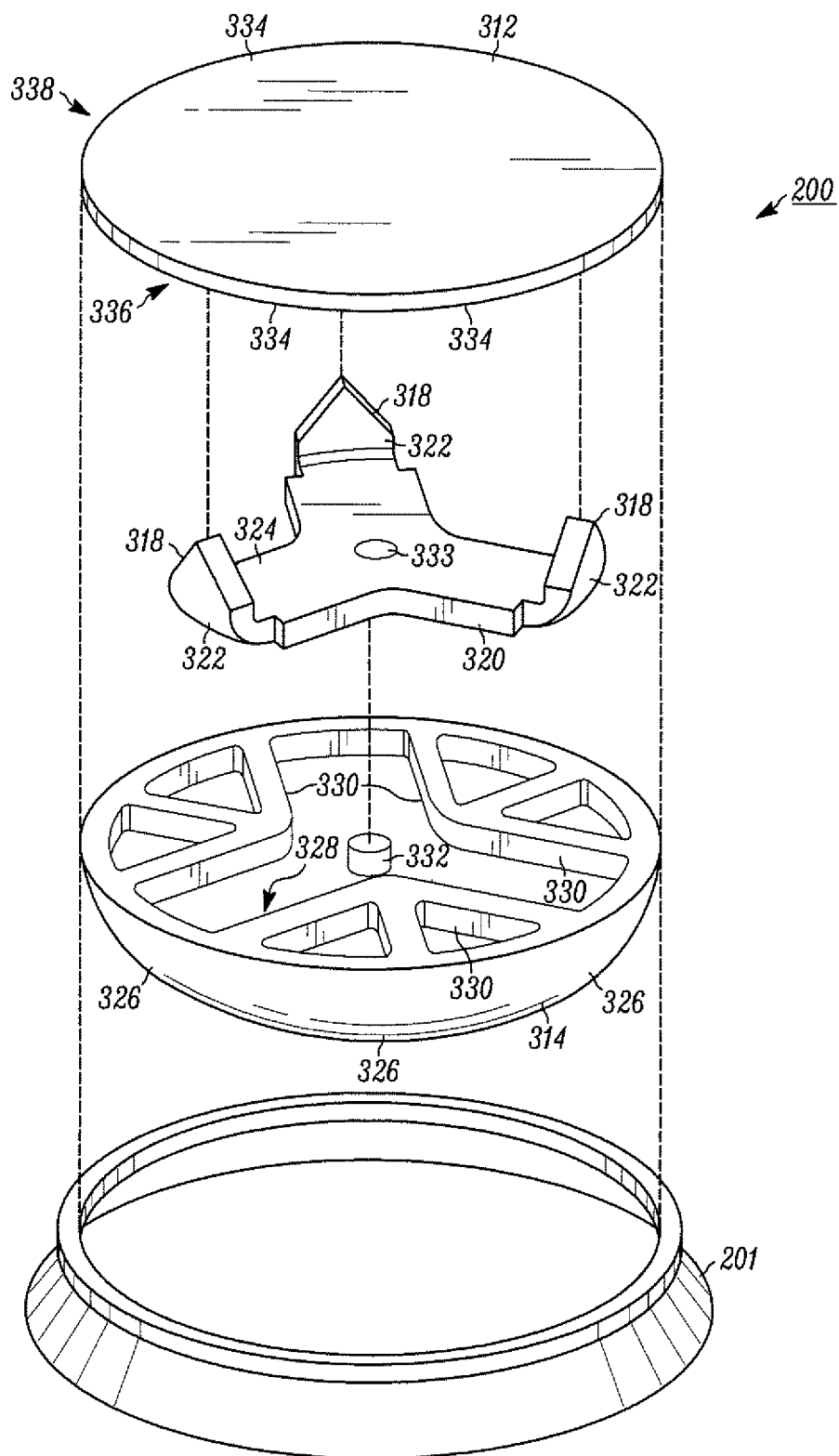


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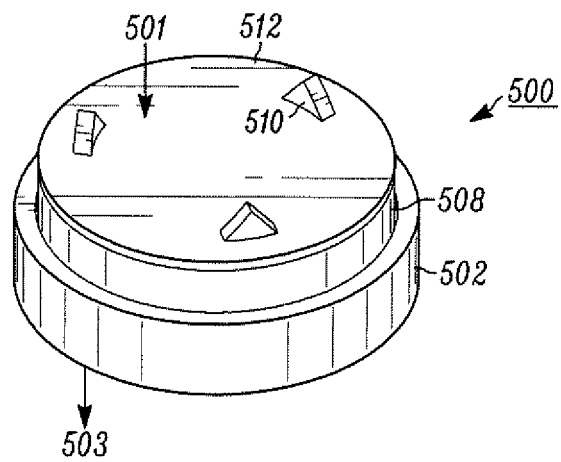


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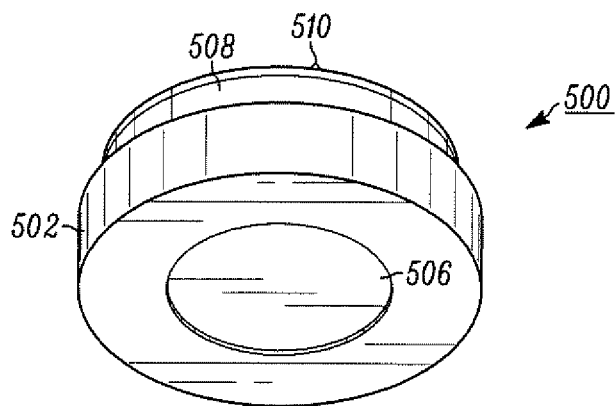


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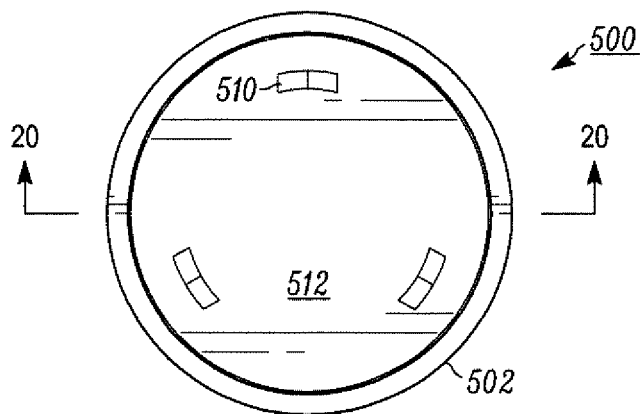


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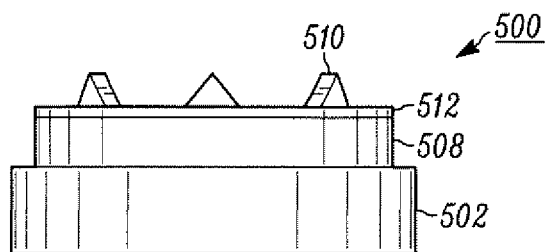


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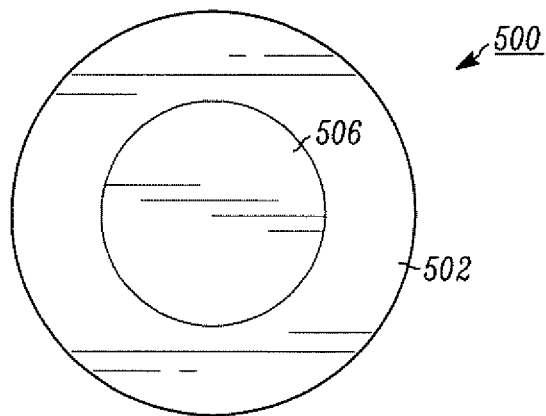


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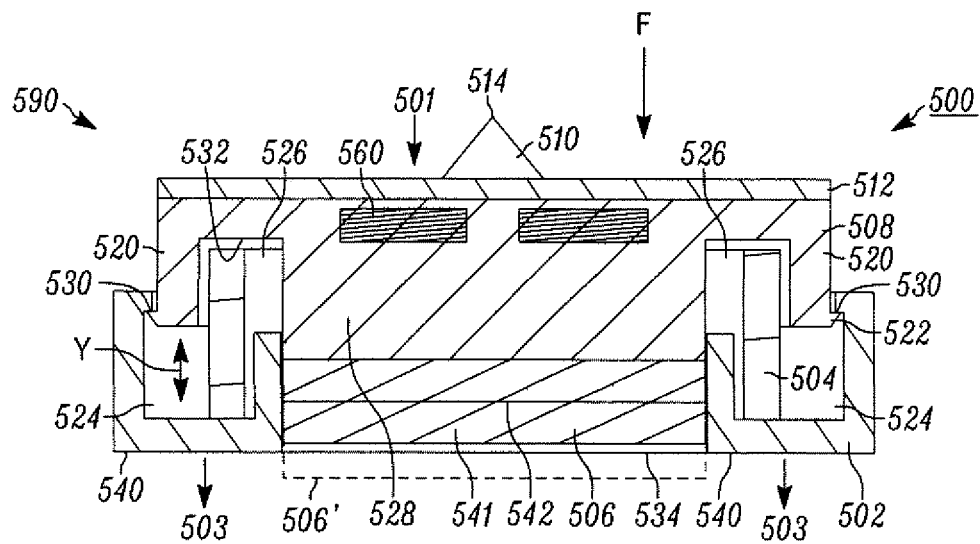


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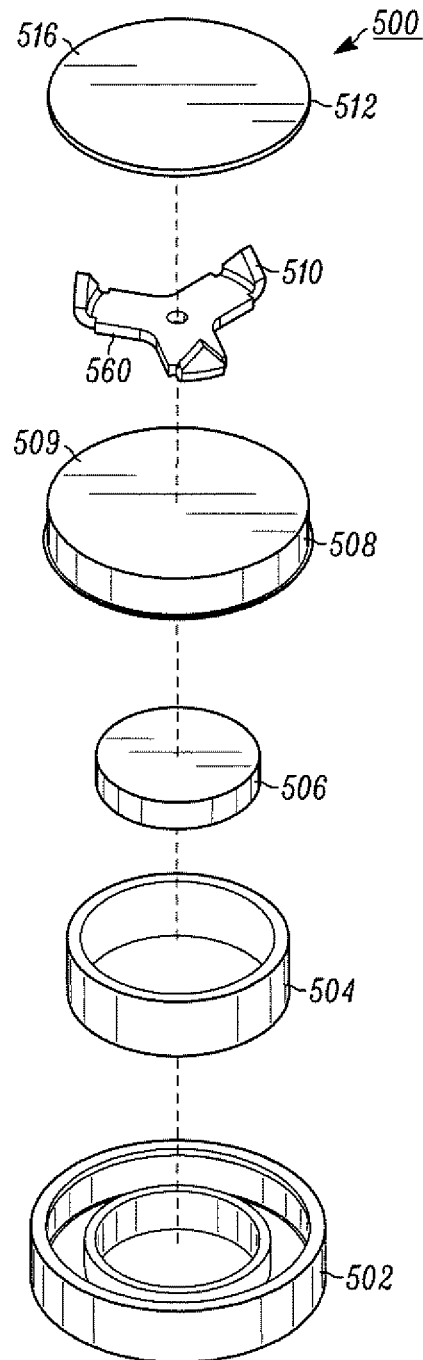


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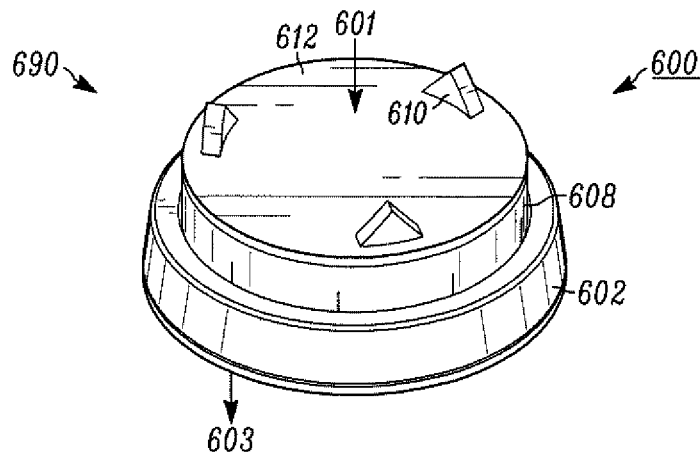


FIG. 22

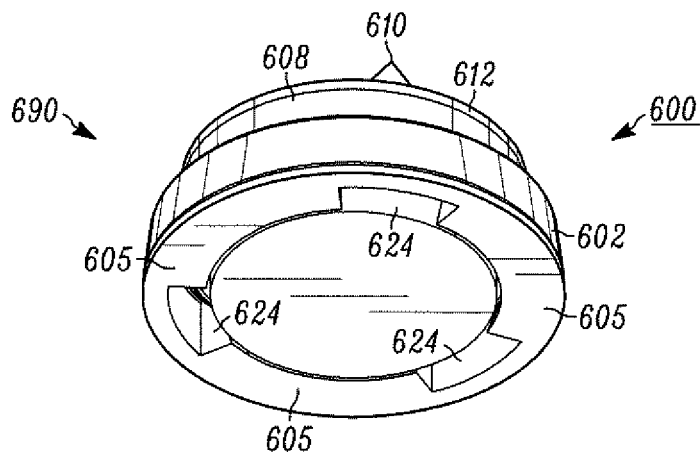


FIG. 23

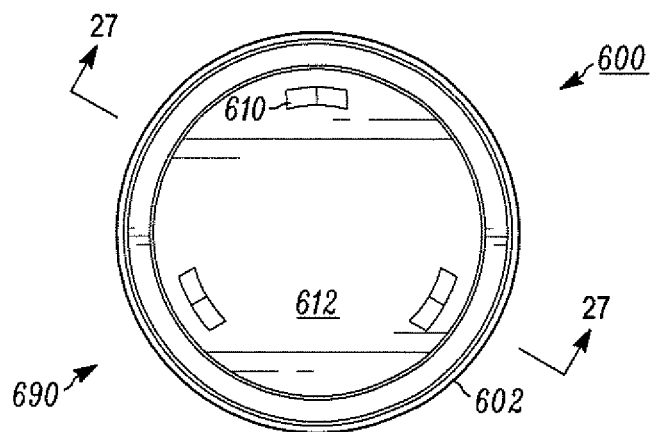


FIG. 24

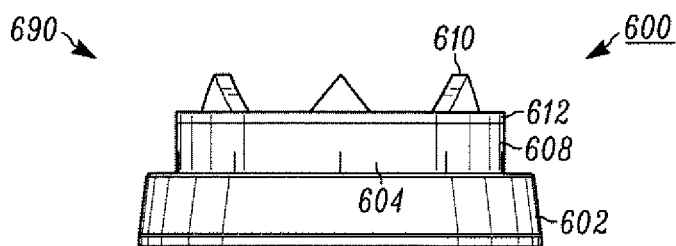


FIG. 25

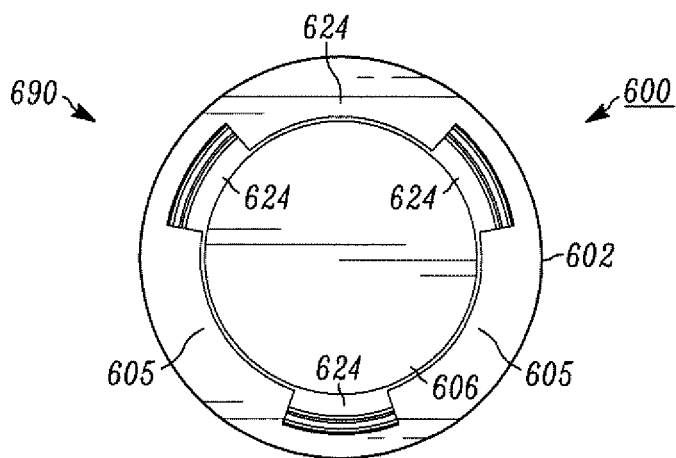


FIG. 26

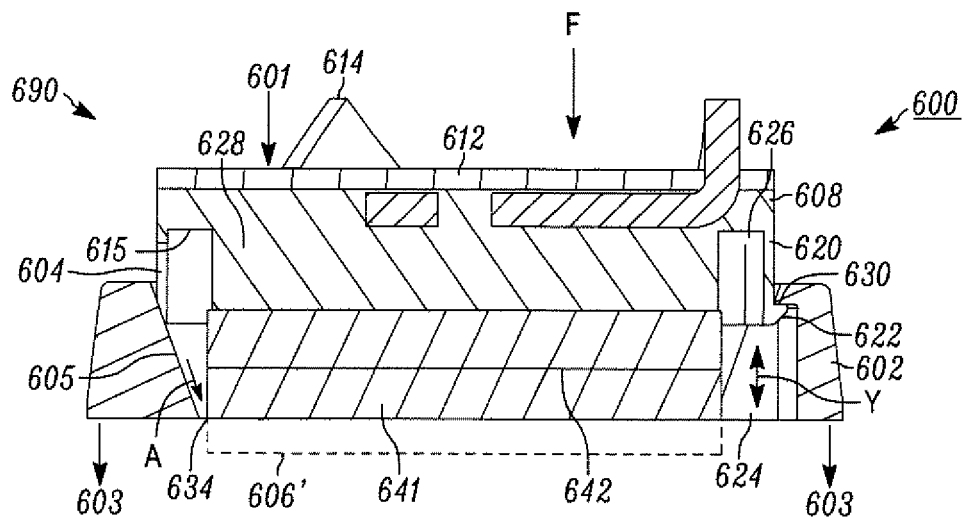


FIG. 27

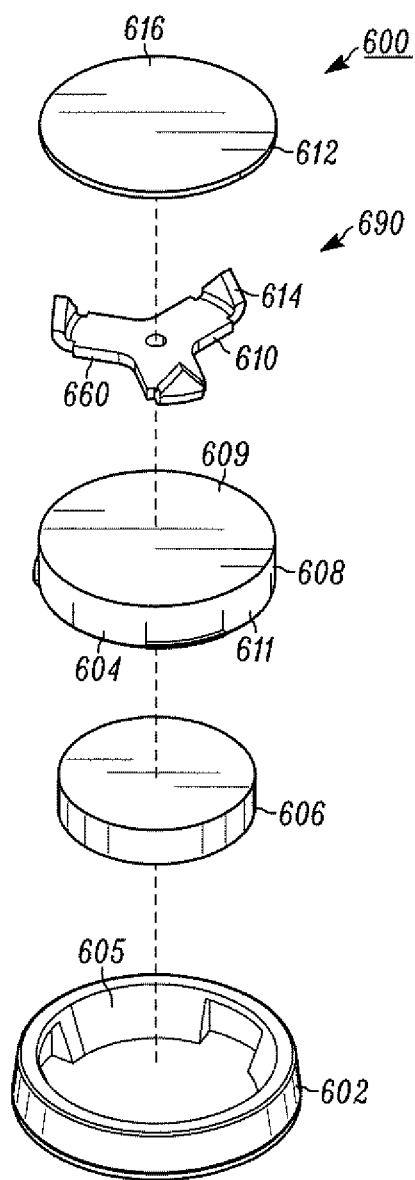


FIG. 28

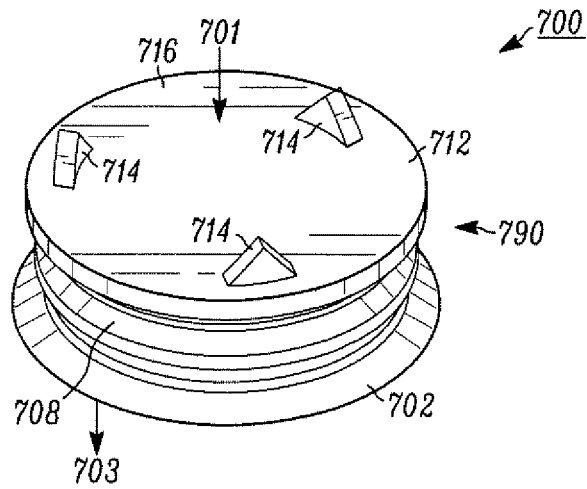


FIG. 29

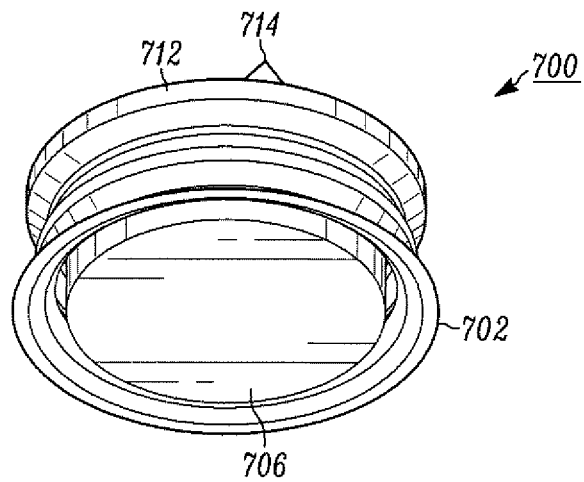


FIG. 30

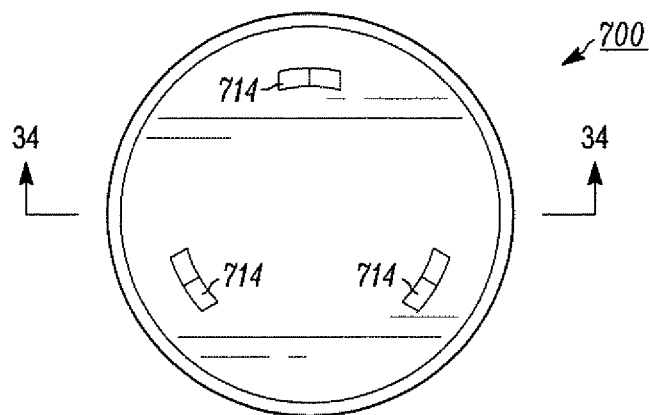


FIG. 31

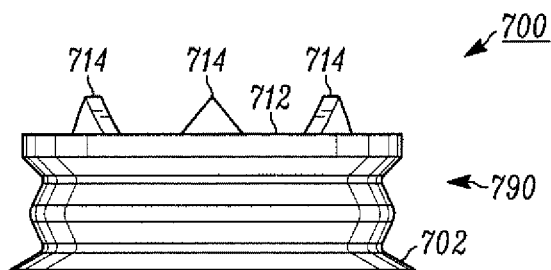


FIG. 32

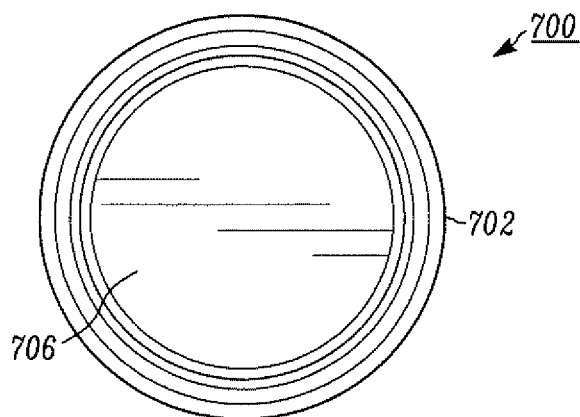


FIG. 33

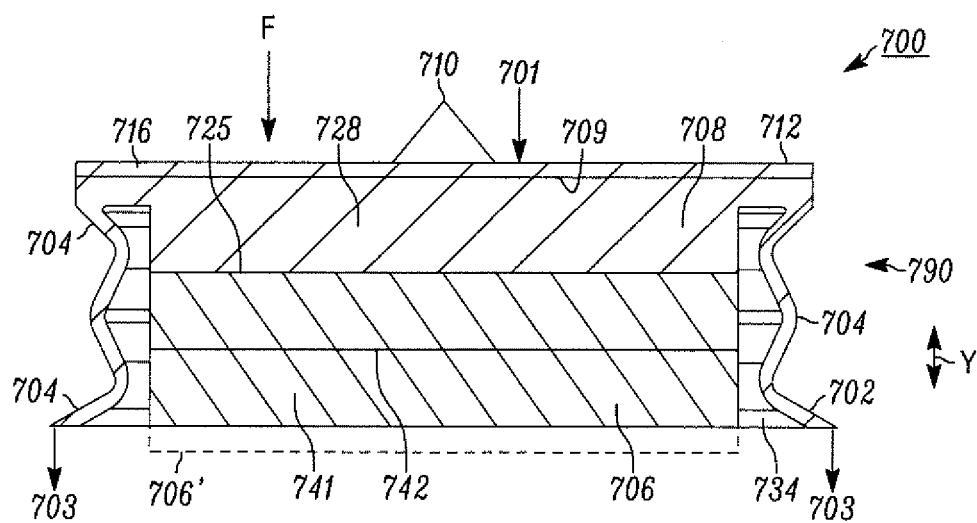


FIG. 34

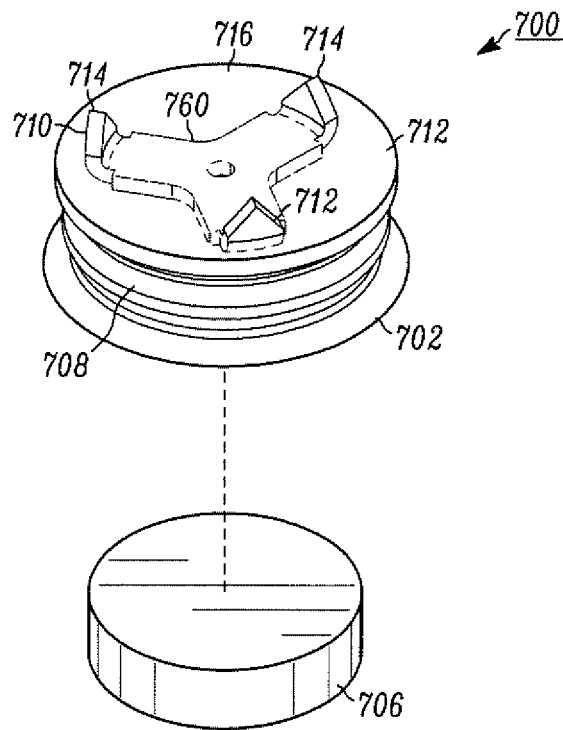


FIG. 35

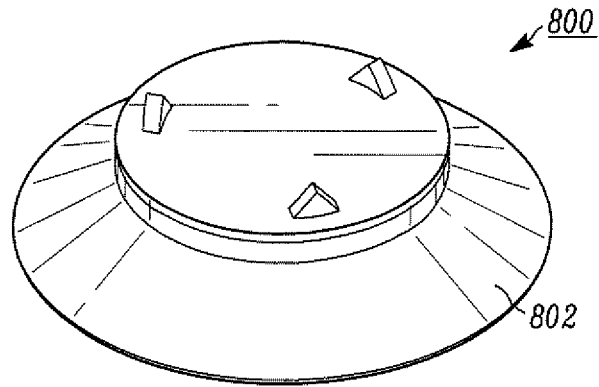


FIG. 36

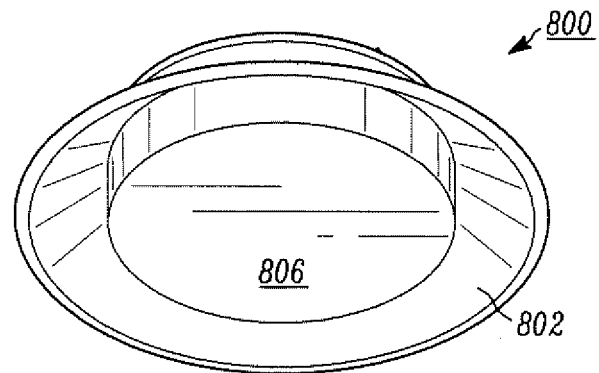


FIG. 37

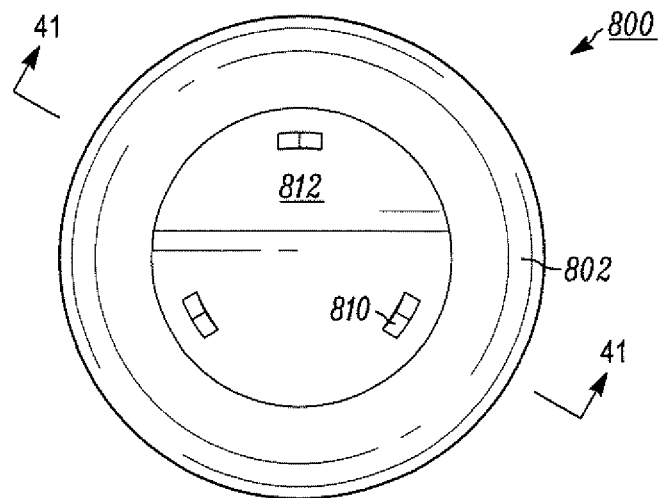


FIG. 38

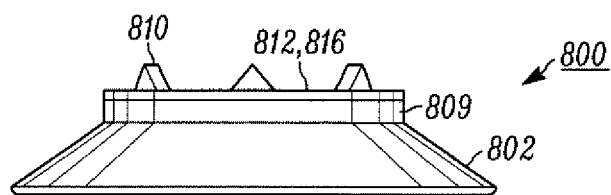


FIG. 39

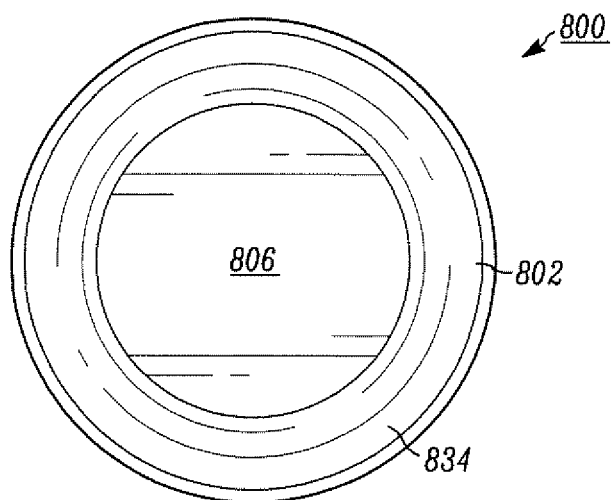


FIG. 40

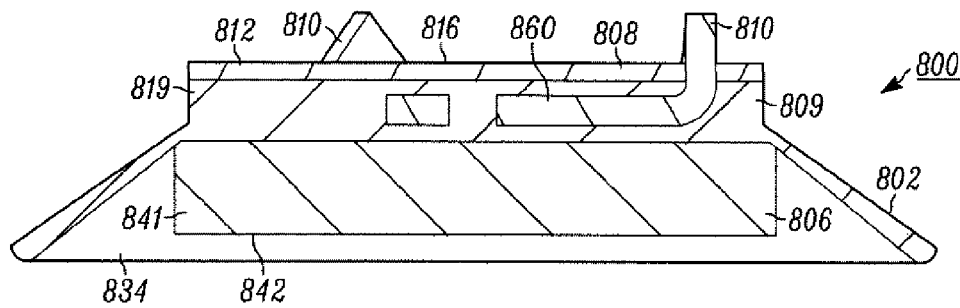


FIG. 41

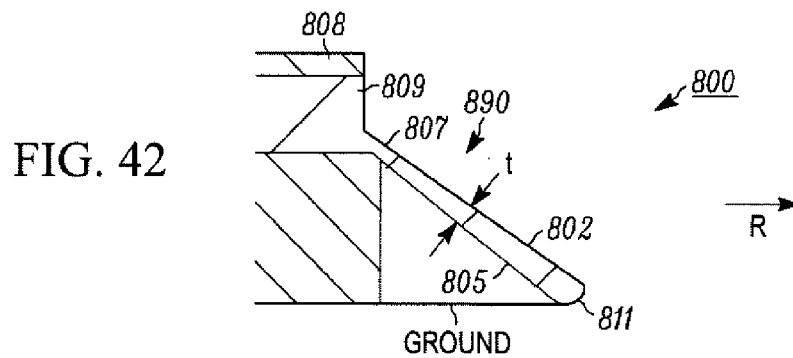


FIG. 42

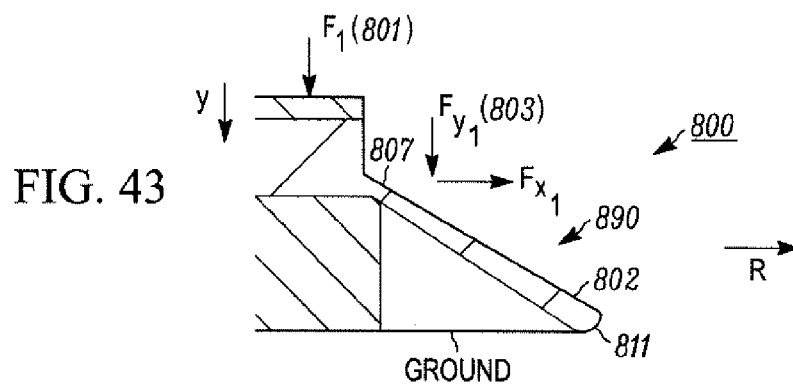


FIG. 43

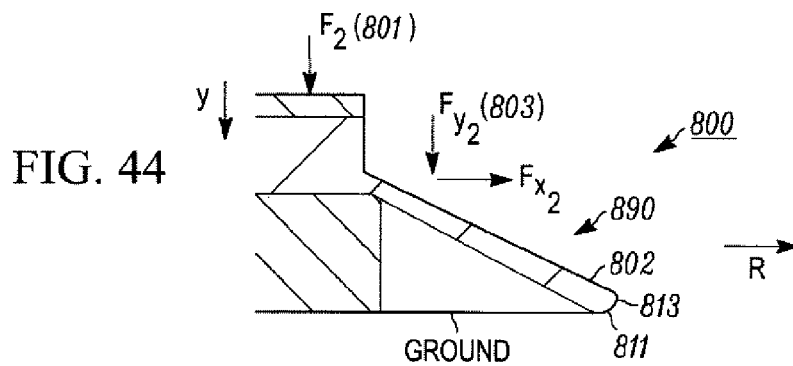


FIG. 44

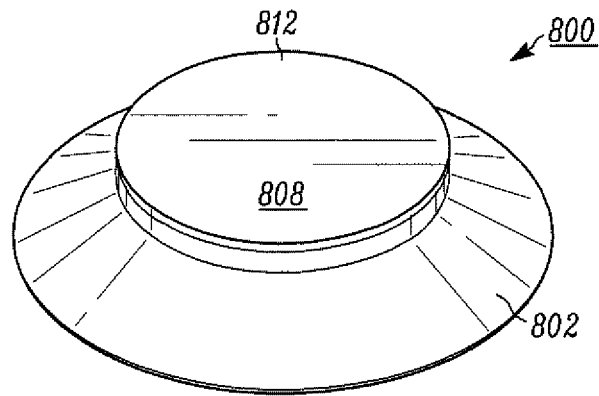


FIG. 45

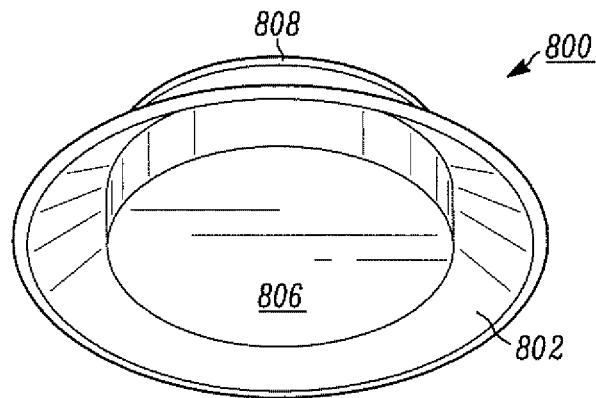


FIG. 46

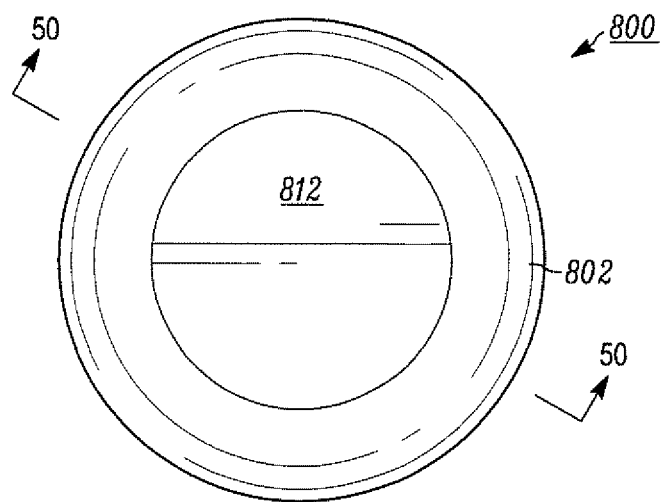


FIG. 47

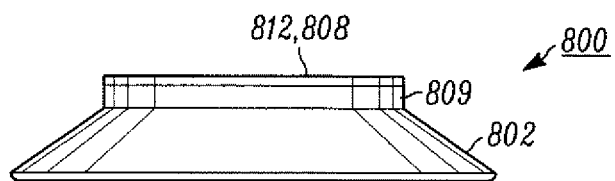


FIG. 48

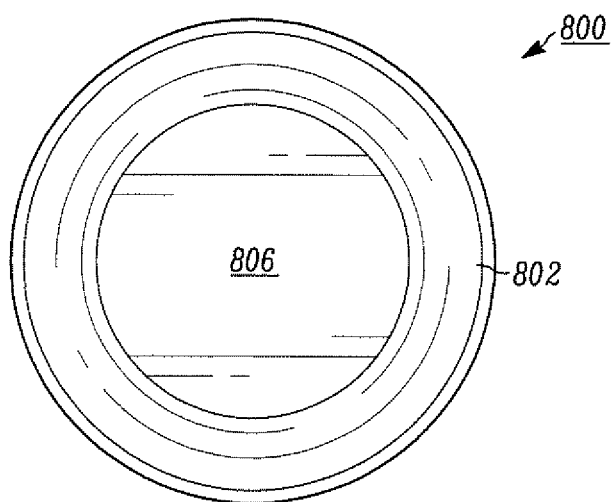


FIG. 49

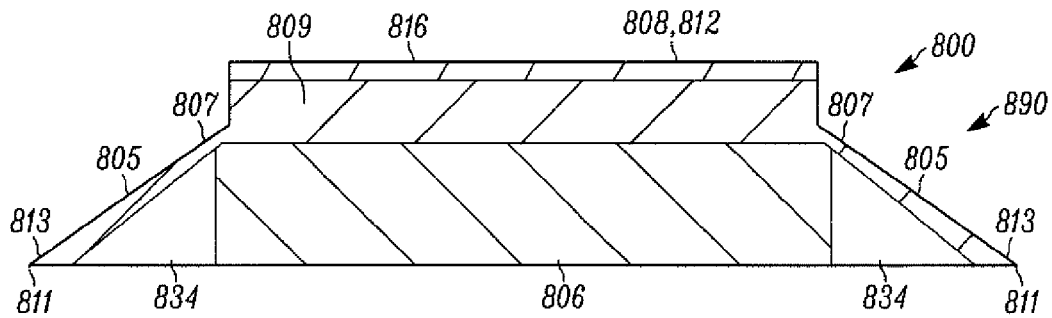


FIG. 50

FIG. 51

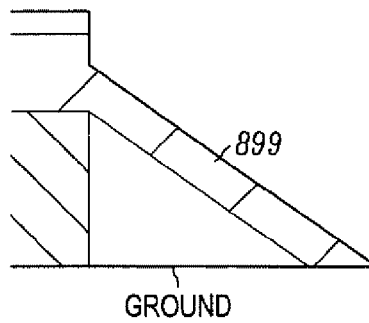


FIG. 52

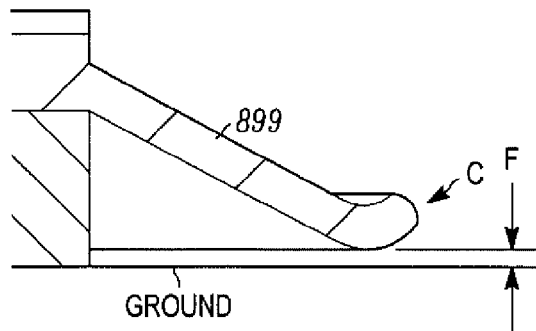
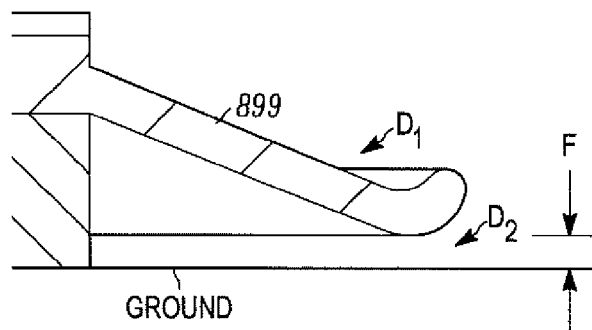


FIG. 53



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REPEL ASSEMBLY AND METHOD**CROSS REFERENCES TO RELATED APPLICATIONS**

The following application is a divisional application claiming priority under 35 U.S.C. §121 to co-pending U.S. Non-provisional Patent Application Serial No. 13/929,173 entitled REPEL ASSEMBLY AND METHOD filed Jun. 27, 2013, which claims priority under 35 U.S. §119(e) to U.S. Provisional Patent Application Ser. No. 61/666,419 filed Jun. 29, 2012 entitled ATTACHMENT GLIDER, and to U.S. Provisional Patent Application No. 61/798,803 filed Mar. 15, 2013 entitled REPEL ASSEMBLY AND METHOD. The above-identified applications are incorporated herein by reference in their entirety for all purposes.

TECHNICAL FIELD

The present disclosure relates to a repel assembly and method, and more particularly, a repel assembly and method that is secured to or near an attachment glider on an object to be moved preventing the collection of debris on the attachment glider.

BACKGROUND

In the moving industry, it is quite usual to face the situation of having to move large, heavy, and sometimes awkwardly shaped objects such as furniture within the confines of buildings. The movement of large objects and furniture are not limited to the venue of commercial buildings, but equally experienced in residential settings with interest in relocating furniture to achieve a new floor plan or moving the furniture or large objects to a new home. Other occurrences arise from office downsizing, team wiring upgrades, etc. that frequently mandate office reconfigurations requiring that the furniture be moved or rotated. Furniture is also frequently moved for example, in healthcare and educational facilities for cleaning. In these instances, as in the installation of modular carpet, it is desirable to move the furniture quickly, with the least possible effort and, preferably, after hours with a limited number of workers.

Office equipment is usually moved with a hand truck, four-wheel dolly, or the like and can take several individuals working together. The work is hard, labor expensive and injuries occur. Other furniture, such as workstations, computers, etc. are also difficult to move. The preferable method of moving the heavy objects is for professional movers to pick the object up and carry it by hand, but this is not always an economically feasible or a possible arrangement because of the lack or cost of labor.

An alternative to hand trucks and dollies for movement of furniture and objects includes the use of attachment gliders, typically placed under the legs of the object to be moved. The attachment glider comprises various contact surfaces for engaging the type of material forming the floor across which the object or furniture is moved. For example, for a wood or tile floor, the attachment glider will have a textile surface such as felt. For a floor covered with carpet, the attachment glider will have a hard smooth surface such as plastic. Such surfaces reduce the friction and/or wear that occurs from the object moving across the floor's surface.

One example of hand glider assemblies are those shown in U.S. patent application Ser. No. 13/491,703 entitled ATTACHMENT GLIDER that was filed on Jun. 8, 2012. The

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ATTACHMENT GLIDER application was assigned to the assignee of the present disclosure and is incorporated herein by reference.

SUMMARY

One example embodiment includes a repel assembly comprises an engagement surface having an adhesive plane for securing to an object, a plurality of attachment spikes extending from the engagement surface at an angle transverse to the adhesive plane and a transport surface for supporting a fixture coupled to the plurality of attachment spikes, the fixture being positioned between the engagement surface and the transport surface. The repel assembly further includes an annular ring having an upper and lower ring coupled to the repel assembly, the lower ring having first and second ends spaced by a wiper body such that the annular ring repels debris from contacting and/or collecting on the transport surface.

Another example embodiment includes a polymeric annular repel ring for the prevention of attraction, contact, and/or collection of debris to an attachment glider. The annular repel ring comprises an upper ring and a lower ring spaced by a wiper body. The upper ring is for securing to an attachment glider during use. The lower ring divergently extends from the upper ring from a first end to a second end, forming the wiper body therebetween.

While another example embodiment includes a method of repelling debris from an attachment glider. The steps comprise surrounding an attachment glider with an annular repel ring, the annular repel ring having upper and lower rings defined by a wiper body therebetween and divergently extending the wiper body away from the upper ring toward the lower ring. The steps also include constructing the wiper body to allow for flexible in and out rotation of at least a portion of the lower ring relative to the upper ring.

Yet another example embodiment of the present disclosure comprises an assembly for repelling or preventing the collection of debris at the base of an object. The assembly includes a support plate having upper and lower regions. The upper region supports an engagement surface having an adhesive plane for securing to an object. The assembly also comprises a transport surface positioned within an opening in the lower region of the support plate, the transport surface for making primary contact with the floor for carrying a first portion of a load of an object during use; and an annular wiper having first and second annular ends to form a tapered annular arm. The first end is integrally connected to the support plate and the second annular end extends from the first annular end. The annular wiper repels and prevents debris from contacting and collecting on the transport surface.

Another example embodiment of the present disclosure comprises method for repelling or preventing the collection of debris at the base of an object, the method comprising the steps of: providing a support plate having upper and lower regions, the upper region supporting an engagement surface having an adhesive plane for securing to an object; positioning a transport surface within an opening in the lower region of the support plate, the transport surface for making primary contact with the floor for carrying a first portion of a load of an object during use; and integrally connecting by molding an annular wiper having first and second annular ends to form a tapered annular arm to the support plate, the second annular end extending from the first annular end, the annular wiper repelling and preventing debris from contacting and collecting on the transport surface.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other features and advantages of the present disclosure will become apparent to one skilled in the

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art to which the present invention relates upon consideration of the following description of the invention with reference to the accompanying drawings, wherein like reference numerals refer to like parts unless described otherwise throughout the drawings and in which:

FIG. 1 is perspective view of a repel assembly secured to an attachment glider constructed in accordance with one example embodiment of the present disclosure;

FIG. 1A is a perspective view of an annular ring constructed in accordance with one example embodiment of the present disclosure;

FIG. 1B is an upper plan view of the annular ring of FIG. 1A;

FIG. 1C is an elevation side view of the annular ring of FIG. 1A;

FIG. 1D is a bottom plan view of the annular ring of FIG. 1A;

FIG. 2 is a top plan view of FIG. 1;

FIG. 3 is a side elevation view of FIG. 1;

FIG. 4 is a section view of FIG. 2 along section lines 4-4;

FIG. 5 is a perspective view of a repel assembly constructed in accordance with another example embodiment of the present disclosure;

FIG. 6 is a top plan view of FIG. 5;

FIG. 7 is a side elevation view of FIG. 5;

FIG. 8 is a bottom plan view of FIG. 5;

FIG. 9 is an exploded perspective view of FIG. 5;

FIG. 10 is a perspective view of a repel assembly constructed in accordance with another example embodiment of the present disclosure;

FIG. 11 is a top plan view of FIG. 10;

FIG. 12 is a side elevation view of FIG. 10;

FIG. 13 is a bottom plan view of FIG. 10;

FIG. 14 is an exploded perspective view of FIG. 14;

FIG. 15 is an upper perspective view of a repel assembly constructed in accordance with another example embodiment of the present disclosure;

FIG. 16 is a lower perspective view of FIG. 15;

FIG. 17 is a top plan view of FIG. 15;

FIG. 18 is a side elevation view of FIG. 15;

FIG. 19 is a bottom plan view of FIG. 15;

FIG. 20 is a section view of FIG. 17 along section lines 20-20;

FIG. 21 is an exploded perspective view of FIG. 15;

FIG. 22 is an upper perspective view of a repel assembly constructed in accordance with another example embodiment of the present disclosure;

FIG. 23 is a lower perspective view of FIG. 22;

FIG. 24 is a top plan view of FIG. 22;

FIG. 25 is a side elevation view of FIG. 22;

FIG. 26 is a bottom plan view of FIG. 22;

FIG. 27 is a section view of FIG. 24 along section lines 27-27;

FIG. 28 is an exploded perspective view of FIG. 22;

FIG. 29 is an upper perspective view of a repel assembly constructed in accordance with another example embodiment of the present disclosure;

FIG. 30 is a lower perspective view of FIG. 29;

FIG. 31 is a top plan view of FIG. 29;

FIG. 32 is a side elevation view of FIG. 29;

FIG. 33 is a bottom plan view of FIG. 29;

FIG. 34 is a section view of FIG. 31 along section lines 34-34;

FIG. 35 is an exploded perspective view of FIG. 29; and

FIG. 36 is an upper perspective view of a repel assembly constructed in accordance with another example embodiment of the present disclosure;

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FIG. 37 is a lower perspective view of FIG. 36;

FIG. 38 is a top plan view of FIG. 36;

FIG. 39 is a side elevation view of FIG. 36;

FIG. 40 is a bottom plan view of FIG. 36;

FIG. 41 is a section view of FIG. 38 along section lines 41-41;

FIG. 42 is a portion of the sectional view of FIG. 41 illustrating the repel assembly in an unloaded position;

FIG. 43 is a portion of the sectional view of FIG. 41 illustrating the repel assembly in a first loaded/wear position;

FIG. 44 is a portion of the sectional view of FIG. 41 illustrating the repel assembly in a second loaded/wear position;

FIG. 45 is an upper perspective view of a repel assembly constructed in accordance with another example embodiment of the present disclosure;

FIG. 46 is a lower perspective view of FIG. 45;

FIG. 47 is a top plan view of FIG. 45;

FIG. 48 is a side elevation view of FIG. 45;

FIG. 49 is a bottom plan view of FIG. 45;

FIG. 50 is a section view of FIG. 47 along section lines 50-50;

FIG. 51 is a portion of a sectional view of a repel assembly having a uniform cover thickness in an unloaded position;

FIG. 52 is a portion of a sectional view of a repel assembly having a uniform cover thickness in a first loaded/wear position; and

FIG. 53 is a portion of a sectional view of a repel assembly having a uniform cover thickness in a first loaded/wear position.

DETAILED DESCRIPTION

Referring now to the figures generally wherein like numbered features shown therein refer to like elements throughout unless otherwise noted. The present disclosure relates to a repel assembly and method, and more particularly, a repel assembly and method that is secured to or near an attachment glider on an object to be moved preventing the collection of dirt, dust, and hair collectively or individually “debris” on the attachment glider.

FIG. 1 illustrates a perspective view of a repel assembly 200 constructed in accordance with one example embodiment of the present disclosure comprising and secured to an attachment glider 101. The repel assembly 200 also includes an annular ring 201 having an upper ring 202 and a lower ring 204, as further illustrated in the example embodiment of FIGS. 1A, 1B, 1C, and 1D. The annular ring 201 in the illustrated example embodiment is molded from a polymer material. In an alternative example embodiment, the polymer consists of at least one of polymer comprising plastic, polyethylene, polypropylene, an elastomer, rubber, or any combination thereof.

The lower ring 204 acts as a wiper having a first end 203 and a second end 205 spaced by an annular wiper body 207. The annular wiper body 207 diverges away from the first end 203 to the second end 205 at an angle α and defined by a substantially uniform annular thickness “t”. In one example embodiment, the annular ring 201 is made from plastic and/or rubber and has a thickness “t” of approximate 0.063” inches, it relative thin thickness compared to the length of the wiper body 207 allowing for flexible in-and-out movement of the wiper body about the first end 203. In the illustrated example embodiment, the angle α is approximately ten degrees and the wiper body 207 includes a radial annular end “r” at the second end 205, facilitating its repelling features.

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The upper ring **202** is of a constant diameter and molded with and to the lower ring **204**. The upper ring's constant diameter includes an inner diameter **210** and outer diameter **212**.

The repel assembly **200** further comprises an engagement surface **312** for attaching to an object such as furniture and transport surface **314** for contacting the floor on which the object is located. The repel assembly **200** is fixedly attached to form a secured connection to an object (not shown) such as a furniture leg through the combination of an adhesive bond **316** located on the engagement surface **312** and plurality of attachment spikes **318** fixed to the glider and projecting away from the engagement surface.

The transport surface **314** is located opposite the engagement surface **312** and designed to protect the floor from marring or damage during movement of the object across the surface of the floor. The annular ring **201** is designed to surround and envelop the transport surface **314** and prevent debris, such as dirt, dust, hair, and the like from collecting on thereon. In the illustrated example embodiment of FIG. 1, the annular ring **201** remains in constant contact with the floor and parallel with a contact end **414** of the transport surface **314**. In addition, the annular ring **201** is designed to flex in the direction of arrows A (FIG. 1) outward as the wear occurs on the transport surface **314**, reducing its height as illustrated in FIG. 7. Such flexing results in a constant or static wiper force being provided by the annular ring **201** independent of wear height or load to the transport surface **314**.

In an alternative example embodiment, the wiper body **207** includes an altered material or an incorporation of a spring such that the constant or static wiper force is enhanced. The constant or static wiper force provided by the ring **201** and wiper body **207** in FIG. 1 allows the ring to wipe across the floor surface lightly while the transport surface (such as a felt pad) takes the load of the object it is connected to (such as a chair and human). This eliminates the collection of debris on the transport surface **314**, as well prevents damage to the floor surface from the ring **201** or chair as the load is carried by the transport surface.

In the illustrated example embodiment, the engagement surface **312**, transport surface **314**, and annular ring **201** are circularly shaped, but could be constructed to include any geometrical shape to match the geometry portion of the object in which the glider is secured without departing from the spirit and scope of the present disclosure.

Illustrated in FIGS. 6-9, are the top plan, side elevation, and bottom plan views of the example embodiment of FIG. 5. FIG. 9 illustrates an exploded perspective view of the example embodiment of FIG. 5. In particular, the engagement surface **312** and transport surface **314** are separated by an intermediate surface **315**. The intermediate surface **315** supports a metal fixture **320** having a plurality of transversely curved ends **322** extending from a relatively planar body **324**. The transversely curved ends **322** support a respective one of the plurality of attachment spikes **318**.

In one example embodiment, the intermediate surface **315** is a circular disc having a radial wall **326** supporting a cavity region **328**. The cavity region **328** includes a number of support walls **330** for retaining the metal fixture **320** and to advantageously prevent the metal fixture from rotating or moving within the cavity during use. The number support walls **330** correspond to the number of curved ends **322**. The cavity **328** further comprises an alignment projection **332** for guiding the metal fixture **320** having a corresponding opening **333** into the cavity during assembly.

Once the metal fixture **320** is seated into the cavity **328**, the engagement surface **312** is positioned over the metal fixture

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and secured to the intermediate surface **315**. That is, the engagement surface **312** comprises a double-sided adhesive plane **334**, allowing for adhesive bonding to both an assembly side **336** and engagement side **338** of the engagement surface. In the illustrated example embodiment, the engagement surface **312** is approximately $\frac{1}{32}$ " of one-inch thick and both sides **336**, **338** include a protective sheet to cover the adhesive surface that is removed upon assembly or attachment to the object.

In addition to the adhesive bond, the plurality of attachment spikes **318** penetrate the engagement surface **312** during assembly. This penetration assists in the securing of the engagement surface **312** to the intermediate surface **315**. The intermediate surface **315** is secured to the transport surface **114** by an adhesive, such as glue positioned and cured between the surfaces. In an alternative example embodiment, another engagement surface **312** is positioned between for securing the intermediate surface **315** to the transport surface **314**.

In the illustrated example embodiment, the transport surface **314** is a soft textile material, such as felt approximately $\frac{1}{8}$ " of one inch in thickness and the metal fixture **320** is formed from 1020 steel. The intermediate surface **315** is molded from a relatively hard thermoplastic. In the illustrated example embodiment of FIGS. 1-9, the repel assembly **200** is particularly suitable for non-carpet floors, such as wood, laminate, vinyl, tile, and the like.

The plurality of attachment spikes **318** protrude from the attachment surface **312** approximately $\frac{1}{16}$ " of one inch and include a total of three located equally at 120 degrees from each other. This allows for securing to the object for transport, such as a wooden leg of furniture without the need of a hammer or tools. While the penetration of the spikes **318** are advantageously designed in size and configuration to eliminate the need for tools, the spikes' **318** design and configuration in combination with the adhesive bond of the adhesive plane **334** provide sufficient strength to resist separation after attachment, shear stresses, or failure during transport of the object.

In the illustrated example embodiment, the annular ring **201** is secured to the outer diameter **375** of the intermediate surface **315** by a press-fit connection with the inner diameter **210** of the upper ring **202**. In alternative example embodiment, an adhesive such as glue is used to further secure the upper ring **202** to the intermediate surface **315**. In yet another example embodiment, the annular ring **201**, and particularly the upper ring **202** is molded into and with the intermediate surface **315**.

The flexible in-and-out movement of the wiper body **207** about the first end **203** advantageously prevents collection of dirt, dust, hair, and debris from collecting to the transport surface **314**. Such debris is more difficult to clean than if the debris was alone on the surface of the floor. In the illustrated example embodiment, the second end of the **205** of the annular ring **201** contacts the floor at the same point as the compressed transport surface **314**. Stated another way, the location of the annular ring **201** about the intermediate surface **315** is such that the second end **205** defined by h1 terminates at the contact end **414** when compressed by the weight of the object or furniture defined by h2 as illustrated in FIG. 7. Therefore, under compression, the transport surface's **314** stack-up once assembled results in the substantial alignment of the contact end **414** with the second end **205** of the annular ring **201**. This prevents the collection or contact of debris with the transport surface **314**.

In the illustrated example embodiment, annular ring **201** is attached by inner ring **210** or is molded with the intermediate

surface **315**. In another example embodiment, the annular ring **201** is attached to the object or furniture leg covering the attachment glider and its second end **205** terminates at the contact end **414** when compressed by the weight of the object or furniture.

FIG. **10** illustrates a perspective view of a repel assembly **200** constructed in accordance with another example embodiment of the present disclosure secured to an attachment glider **101**. The repel assembly **200** includes an annular ring **201** having an upper ring **202** and a lower ring **204**.

The lower ring **204** acts as a wiper having a first end **203** and a second end **205** spaced by an annular wiper body **207**. The annular wiper body **207** diverges away from the first end **203** to the second end **205** at an angle α and defined by a substantially uniform annular thickness "t". In one example embodiment, the annular ring **201** is made from plastic and/or rubber and has a thickness "t" of approximate 0.063" inches, allowing for flexible in-and-out movement of the wiper body **207** about the first end **203**. In the illustrated example embodiment, the angle α is approximately ten degrees.

The upper ring **202** is of a constant diameter and molded with and to the lower ring **204**. The upper ring's constant diameter includes an inner diameter **210** and outer diameter **212**.

The repel assembly **200** further comprises an engagement surface **312** for attaching to an object such as furniture and transport surface or support surface **314** for contacting the floor on which the object is located. The repel assembly **200** is fixedly attached to form a secured connection to an object (not shown) such as a furniture leg through the combination of an adhesive bond **316** located on the engagement surface **312** and plurality of attachment spikes **318** fixed to the glider and projecting away from the engagement surface.

The transport surface **314** is located opposite the engagement surface **312** and designed to protect the floor from marring or damage during movement of the object across the surface of the floor. In the illustrated example embodiment, the engagement surface **312**, transport surface **314**, and annular ring **201** are circularly shaped, but could be constructed to include any geometrical shape to match the geometry portion of the object in which the glider is secured without departing from the spirit and scope of the present disclosure.

Illustrated in FIGS. **11-13**, are the top plan, side elevation, and bottom plan views of the example embodiment of FIG. **10**. FIG. **14** illustrates an exploded perspective view of the example embodiment of FIG. **10**. In particular, the transport surface **314** supports a metal fixture **320** having a plurality of transversely curved ends **322** extending from a relatively planar body **324**. The transversely curved ends **322** support a respective one of the plurality of attachment spikes **318**.

In one example embodiment, the transport surface **314** is a circular cup having an upwardly curved radial wall **326** supporting a cavity region **328**. The cavity region **328** includes a number of support walls **330** for retaining the metal fixture **320** and to advantageously prevent the metal fixture from rotating or moving within the cavity during use. The number support walls **330** correspond to the number of curved ends **322**. The cavity **328** further comprises an alignment projection **332** for guiding the metal fixture **320** having a corresponding opening **333** into the cavity during assembly.

Once the metal fixture **320** is seated into the cavity **328**, the engagement surface **312** is positioned over the metal fixture and secured to the transport surface **314**. That is, the engagement surface **312** comprises a double-sided adhesive plane **334**, allowing for adhesive bonding to both an assembly side **336** and engagement side **338** of the engagement surface. In the illustrated example embodiment, the engagement surface

is approximately $\frac{1}{32}$ " of one-inch thick and both sides **336**, **338** include a protective sheet to cover the adhesive surface that is removed upon assembly or attachment to the object.

In addition to the adhesive bond, the plurality of attachment spikes penetrate the engagement surface **312** during assembly. This penetration assists in the securing of the engagement surface **312** to the transport surface **314**.

In the illustrated example embodiment, the transport surface **314** is molded from a thermoplastic of relatively hard properties and the metal fixture **320** is formed from 1020 steel. The transport surface **314** further comprises a contact area **340** for engaging the floor that has a relatively smooth low friction surface advantageous for efficient transport of the object across a floor. In the illustrated example embodiment of FIGS. **10-14**, the repel assembly **200** is particularly suitable for carpet floors.

The plurality of attachment spikes **318** protrude from the attachment surface **312** approximately $\frac{1}{16}$ " of one inch and include a total of three located equally at 120 degrees from each other. This allows for securing to the object for transport, such as a wooden leg of furniture without the need of a hammer or tools. While the penetration of the spikes **318** are advantageously designed in size and configuration to eliminate the need for tools, the spikes' **318** design and configuration in combination with the adhesive bond of the adhesive plane **334** provide sufficient strength to resist separation after attachment, shear stresses, or failure during transport of the object.

In the illustrated example embodiment of FIGS. **10-14**, the annular ring **201** is secured to the outer diameter **375** of the transfer surface **314** by a press-fit connection with the inner diameter **210** of the upper ring **202**. In alternative example embodiment, an adhesive such as glue is used to further secure the upper ring **202** to the transfer surface **314**. In yet another example embodiment, the annular ring **201**, and particularly the upper ring **202** is molded into and with the transfer surface **314**.

The flexible in-and-out movement of the wiper body **207** about the first end **203** advantageously prevents collection of dirt, dust, hair, and debris from collecting to or near the transport surface **314**. Such debris is more difficult to clean than if the debris was alone on the surface of the floor. In the illustrated example embodiment, the second end of the **205** of the annular ring **201** contacts the floor at the same point as the transport surface **314**. Stated another way, the location of the annular ring **201** about the transport surface **314** is such that the second end **205** terminates at the contact end **414** as illustrated in FIG. **12**.

In the illustrated example embodiment, annular ring **201** is attached by inner ring **210** or is molded with the transfer surface **314**. In another example embodiment, the annular ring **201** is attached to the object or furniture leg covering the attachment glider and its second end **205** terminates at the contact end **414**.

FIGS. **15-21** illustrate a perspective view of a repel assembly **500** constructed in accordance with another example embodiment of the present disclosure. The repel assembly **500** includes a dynamic wear system **590** that allows the transport surface to remain in primary contact with the floor based on the load provided by the object resting upon the assembly, while a lesser, secondary load is applied to an annular wiper that prevents debris from collecting on transport surface. The dynamic wear system **590** in addition, prevents the repel assembly from marking the floor while also facilitating the annular wiper's ability to prevent the collection of dust or debris on the transport surface during use. The repel assembly **500** includes an annular wiper **502**, cushion

504, transport surface **506**, support plate **508**, plurality of spikes **510**, and engagement surface **512**.

The annular wiper **502** and support plate **508** are made from plastic. The annular wiper **502** engages the floor with a secondary load **503** while in contact with the floor, allowing it to act as a dust cover, repelling debris from attracting to the transport surface **506**.

The repel assembly's **500** engagement surface **512** includes a plurality of spikes **514** for attaching to an object such as furniture, or the bottom of a leg, chair, ottoman, dresser, and the like. That is, the repel assembly **500** is fixedly attached to form a secured connection to an object (not shown) such as a furniture leg through the combination of an adhesive bond **516** located on the engagement surface **512** and plurality of attachment spikes **514** fixed to the support plate **508** and projecting away from the engagement surface.

The transport surface **506** in the illustrated example embodiment is made from a cushion-like material, such as foam or felt that contacts the floor on which the object is located. The transport surface **506** is located below the support plate **508**, which advances the transport surface under a primary load **501** carried by the object out of an opening **534**. Since the primary load **501** by the object is greater than the secondary load **503** applied to the annular wiper **502**, marking or scratching of the floor is avoided. This prevention of scratches or marks on the floor and is achieved by the repel assembly's dynamic wear system **590**.

In the illustrated example embodiment, the engagement surface **512**, transport surface **506**, support plate **508**, cushion **504**, and annular wiper **502** are circularly shaped, but could be constructed to include any geometrical shape to match the geometry profile of the object in which the repel assembly **500** is secured without departing from the spirit and scope of the present disclosure.

Illustrated in FIGS. **17-19**, are the top, side elevation, and bottom plan views of the example embodiment of FIG. **15**. FIG. **21** illustrates an exploded perspective view of the example embodiment of FIG. **15**. In the illustrated example embodiment, except for the metal spikes **510**, transport surface **506**, cushion **504**, and adhesive **516**, the entire assembly is formed from plastic. The cushion **504**, provides the reduced or secondary load absorbed from the object and transmitted to the annular wiper **502**, and in the illustrated example embodiment, the cushion **504** is made from ethylene vinyl acetate (EVA) material. The cushion **504** however, could be made from other compressible materials, such as a metal spring or other materials having similar properties without departing from the spirit and scope of the present disclosure. In one example embodiment, the transport surface **506** is felt, a polymer such as polyethylene or polypropylene, or foam material, capable of preventing marring or marking of the floor during use.

A metal fixture **560** forming the plurality of attachment spikes **510** is seated into a form or fixture (not shown) in the top of the support plate **508**. The engagement surface **512** comprises the double-sided adhesive **516**, allowing for adhesive bonding to both the object (not shown) and repel assembly **500**. In the illustrated example embodiment, the engagement surface **512** is approximately $\frac{1}{32}$ " of one-inch thick and the upper side includes a protective sheet to cover the adhesive surface that is removed upon assembly or attachment to the object.

In addition to the adhesive bond, the plurality of attachment spikes penetrate the engagement surface **512** during assembly. This penetration assists in the securing of the engagement surface **512** to the object.

The plurality of attachment spikes **514** protrude from the attachment surface **512** approximately $\frac{1}{16}$ " of one inch and include a total of three located equally at 120 degrees from each other. This allows for securing to the object for transport, such as a wooden leg of furniture without the need of a hammer or tools. While the penetration of the spikes **514** are advantageously designed in size and configuration to eliminate the need for tools, the spikes' **514** design and configuration in combination with the adhesive bond of the engagement surface **512** provide sufficient strength to resist separation after attachment, shear stresses, or failure during transport of the object.

In the illustrated example embodiment of FIGS. **15-21**, the adhesive engagement surface **512** and metal fixture **560** are secured to the upper side **509** of the support plate **508**. The support plate **508** is moveably secured (in the direction of arrows **Y** in FIG. **20**) to the annular wiper **502** through an annular arm **520** that includes an annular catch **522** that rides in an annular channel **524** of the annular wiper. A circular cavity **526** is provided between the annular arm **520** and a diametrical center post **528** formed in the support plate **508**.

Because the support plate **508** and annular wiper **502** are made of plastic, the annular arm **520** and wiper elastically deform as the arms snap into the channel **524** during assembly. The annular arms **520** hold the support plate **508** into position by an annular abutment **530** of the wiper **502** surrounding the channel and engaging the annular catch **522** extending from the arms. An underside rim **532** of the support plate **508** rides on the cushion **504**. The dynamic wear system **590** formed in part by the channel **524**, cushion **504**, circular cavity **526**, and arm **520** allow for the vertical movement or translation of the annular wiper **508** independently from the transport surface **506**, as indicated by arrows **Y**.

During use, the primary load **501** generated by the weight of the object acting down on the repel assembly **500** (as indicated by the arrow **F** in FIG. **20**) causes the downward movement or translation of the support plate **508** as described above, and accordingly, the movement of the support plate diametrical center post **528**. The center post **528** thereby engages in its entirety and substantially uniformly, the transport surface **506**, thus advancing the transport surface (**506'** shown in phantom) out of an opening **534** in the bottom of the annular wiper **502**. The lesser, secondary load **503** originated by the object is reduced and absorbed by the cushion **504** before being applied to the annular wiper **502**. This prevents the annular wiper from marring or marking the floor, yet remain in contact with the floor to prevent dust and debris from collecting on the transport surface **506**.

The dual loading nature of the primary load **501** and secondary load **503** of the dynamic wear system **590**, advantageously prevents collection of dirt, dust, hair, and debris from collecting to or near the transport surface **506**, while preventing the floor from being damaged over time even as the material **541** wears away from the transport surface. Stated another way, the repel assembly **500** includes the dynamic wear system **590** that allows the transport surface to remain in primary contact with the floor under the greatest load over time, while the annular wiper **502** remains at a safe cleaning contact load with the floor that does not allow for marking or scratches, but keeps the transport surface safe from debris. In another example embodiment, the transport surface **506** includes a wear indicator **542** that informs the user that the amount of material worn from the bottom of the transport surface is no longer sufficient to provide protection to the floor.

FIGS. **22-28** illustrate a perspective view of a repel assembly **600** constructed in accordance with another example

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embodiment of the present disclosure. The repel assembly 600 includes a dynamic wear system 690 that allows the transport surface to remain in primary contact with the floor based on the load provided by the object resting upon the assembly, while a lesser, secondary load is applied to an annular wiper that prevents debris from collecting on transport surface. The dynamic wear system 590 in addition, prevents the repel assembly from marking the floor while also facilitating the annular wiper's ability to prevent the collection of dust or debris on the transport surface during use. The repel assembly 600 includes an annular wiper 602, transport surface 606, support plate 608, plurality of spikes 610, and engagement surface 612.

The annular wiper 602 and support plate 608 are made from plastic. The annular wiper 602 engages the floor with a secondary load 603 while in contact with the floor, allowing it to act as a dust cover, repelling debris from attracting to the transport surface 606.

The repel assembly's 600 engagement surface 612 includes a plurality of spikes 614 for attaching to an object such as furniture, or the bottom of a leg, chair, ottoman, dresser, and the like. That is, the repel assembly 600 is fixedly attached to form a secured connection to an object (not shown) such as a furniture leg through the combination of an adhesive bond 616 located on the engagement surface 612 and plurality of attachment spikes 614 fixed to the support plate 608 and projecting away from the engagement surface.

The transport surface 606 in the illustrated example embodiment is made from a cushion-like material, such as foam or felt that contacts the floor on which the object is located. The transport surface 606 is located below the support plate 608, which advances the transport surface under a primary load 601 carried by the object out of an opening 634. Since the primary load 601 by the object is greater than the secondary load 603 applied to the annular wiper 602, marking or scratching of the floor is avoided. This prevention of scratches or marks on the floor and is achieved by the repel assembly's dynamic wear system 690.

In the illustrated example embodiment, the engagement surface 612, transport surface 606, support plate 608, and annular wiper 602 are circularly shaped, but could be constructed to include any geometrical shape to match the geometry profile of the object in which the repel assembly 600 is secured without departing from the spirit and scope of the present disclosure.

Illustrated in FIGS. 24-26, are the top, side elevation, and bottom plan views of the example embodiment of FIG. 22. FIG. 27 illustrates an exploded perspective view of the example embodiment of FIG. 22. In the illustrated example embodiment, except for the metal spikes 610, transport surface 606, and adhesive 616, the entire assembly 600 is formed from plastic. In one example embodiment, the transport surface 606 is felt, a polymer such as polyethylene or polypropylene, or foam material, capable of preventing marring or marking of the floor during use.

A metal fixture 660 forming the plurality of attachment spikes 610 is seated into a form or fixture (not shown) in the top of the support plate 608. The engagement surface 612 comprises the double-sided adhesive 616, allowing for adhesive bonding to both the object (not shown) and repel assembly 600. In the illustrated example embodiment, the engagement surface 612 is approximately $\frac{1}{32}$ " of one-inch thick and the upper side includes a protective sheet to cover the adhesive surface that is removed upon assembly or attachment to the object.

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In addition to the adhesive bond, the plurality of attachment spikes penetrate the engagement surface 612 during assembly. This penetration assists in the securing of the engagement surface 612 to the object.

The plurality of attachment spikes 614 protrude from the attachment surface 612 approximately $\frac{1}{16}$ " of one inch and include a total of three located equally at 120 degrees from each other. This allows for securing to the object for transport, such as a wooden leg of furniture without the need of a hammer or tools. While the penetration of the spikes 614 are advantageously designed in size and configuration to eliminate the need for tools, the spikes' 614 design and configuration in combination with the adhesive bond of the engagement surface 612 provide sufficient strength to resist separation after attachment, shear stresses, or failure during transport of the object.

In the illustrated example embodiment of FIGS. 22-28, the adhesive engagement surface 612 and metal fixture 660 are secured to the upper side 609 of the support plate 608. The support plate 608 is moveably secured (in the direction of arrows Y in FIG. 27) to the annular wiper 602 through a plurality of annular arms 620 (three in the example embodiment) that each include an annular catch 622 that rides in an annular channel 624 of the annular wiper. A circular cavity 626 is provided between the annular arm 620 and a diametrical center post 628 formed in the support plate 608.

Because the support plate 608 and annular wiper 602 are made of plastic, the annular arms 620 and wiper elastically deform as the arms snap into the channel 624 during assembly. The annular arms 620 hold the support plate 608 into position by an annular abutment 630 of the wiper 602 surrounding the channel 624 and engaging the annular catch 622 extending from the arms.

The dynamic wear system 690 formed in part by the channel 624, wings 604, wedges 605, circular cavity 626, and arm 620 allow for the vertical movement or translation of the support plate 608 and transport surface 606, as indicated by arrows Y. The wings 604 of the support plate 608 are formed by serrations 611 along the perimeter of the support plate. The wings 604 are molded into and extend linearly from the bottom surface 615 of top of the support plate 608 as illustrated in FIG. 27. The wings 604 engage corresponding wedges 605 in the base of the annular wiper 602. The wings over time fold inward in the direction of the wedges 605 moving downward in the direction of arrow A of FIG. 27.

During use, the primary load 601 generated by the weight of the object acting down on the repel assembly 600 (as indicated by the arrow F in FIG. 27) causes the downward movement or translation of the support plate 608 and its wings 604 on the wedges 605 as described above, and accordingly, the movement of the support plate diametrical center post 628. The center post 628 thereby engages in its entirety and substantially uniformly, the transport surface 606, thus advancing the transport surface (606' shown in phantom) out of an opening 634 in the bottom of the annular wiper 602. The lesser, secondary load 603 originated by the object is reduced and absorbed by the wings 604 before being applied to the annular wiper 602. This prevents the annular wiper 602 from marring or marking the floor, yet it remains in contact with the floor to prevent dust and debris from collecting on the transport surface 606.

The dual loading nature of the primary load 601 and secondary load 603 of the dynamic wear system 690, advantageously prevents collection of dirt, dust, hair, and debris from collecting to or near the transport surface 606, while preventing the floor from being damaged over time even as the material 641 wears away from the transport surface. Stated

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another way, the repel assembly 600 includes the dynamic wear system 690 that allows the transport surface 606 to remain in primary contact with the floor under the greatest load over time, while the annular wiper 602 remains at a safe cleaning contact load with the floor that does not allow for marking or scratches, but keeps the transport surface safe from debris. In another example embodiment, the transport surface 606 includes a wear indicator 642 that informs the user that the amount of material worn from the bottom of the transport surface is no longer sufficient to provide protection to the floor.

FIGS. 29-35 illustrate a perspective view of a repel assembly 700 constructed in accordance with another example embodiment of the present disclosure. The repel assembly 700 includes a dynamic wear system 790 that allows the transport surface to remain in primary contact with the floor based on the load provided by the object resting upon the assembly, while a lesser, secondary load is applied to an annular wiper that prevents debris from collecting on transport surface. The dynamic wear system 790 in addition, prevents the repel assembly from marking the floor while also facilitating the annular wiper's ability to prevent the collection of dust or debris on the transport surface during use. The repel assembly 700 includes an annular wiper 702, transport surface 706, support plate 708, plurality of spikes 710, and engagement surface 712.

In the illustrated example embodiment, the annular wiper 702 is integrally molded into the support plate 708, and both are made from plastic. The annular wiper 702 engages the floor with a secondary load 703 while in contact with the floor, allowing it to act as a dust cover, repelling debris from attracting to the transport surface 706.

The repel assembly's 700 engagement surface 712 includes a plurality of spikes 714 for attaching to an object such as furniture, or the bottom of a leg, chair, ottoman, dresser, and the like. That is, the repel assembly 700 is fixedly attached to form a secured connection to an object (not shown) such as a furniture leg through the combination of an adhesive bond 716 located on the engagement surface 712 and plurality of attachment spikes 714 fixed to the support plate 708 and projecting away from the engagement surface.

The transport surface 706 in the illustrated example embodiment is made from a cushion-like material, such as foam or felt that contacts the floor on which the object is located. The transport surface 706 is located below the support plate 708, which advances the transport surface under a primary load 701 carried by the object out of an opening 734. Since the primary load 701 generated by the object is greater than the secondary load 703 applied to the annular wiper 702, marking or scratching of the floor is avoided. This prevention of scratches or marks on the floor and is achieved by the repel assembly's dynamic wear system 790.

The dynamic wear system 790 generated by the primary and secondary loads, protect the floor from marring or damage during movement of the object across the surface of the floor. The secondary load imposed on the annular wiper at a lesser amount since bellows 704 act as shock absorbers, reducing the loading force on the annular wiper, thus preventing marking or scratches to the floor.

In the illustrated example embodiment, the engagement surface 712, transport surface 706, support plate 708, and annular wiper 702 are circularly shaped, but could be constructed to include any geometrical shape to match the geometry profile of the object in which the repel assembly 700 is secured without departing from the spirit and scope of the present disclosure.

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Illustrated in FIGS. 31-33, are the top, side elevation, and bottom plan views of the example embodiment of FIG. 29. FIG. 27 illustrates an exploded perspective view of the example embodiment of FIG. 29. In the illustrated example embodiment, except for the metal spikes 710, transport surface 706, and adhesive 716, the entire assembly 700 is formed from plastic. In one example embodiment, the transport surface 706 is felt, a polymer such as polyethylene or polypropylene, or foam material, capable of preventing marring or marking of the floor during use.

A metal fixture 760 forming the plurality of attachment spikes 710 is seated into a form or fixture (not shown) in the top of the support plate 708. The engagement surface 712 comprises the double-sided adhesive 716, allowing for adhesive bonding to both the object (not shown) and repel assembly 700. In the illustrated example embodiment, the engagement surface 712 is approximately 1/32" of one-inch thick and the upper side includes a protective sheet to cover the adhesive surface that is removed upon assembly or attachment to the object.

In addition to the adhesive bond, the plurality of attachment spikes penetrate the engagement surface 712 during assembly. This penetration assists in the securing of the engagement surface 712 to the object.

The plurality of attachment spikes 714 protrude from the attachment surface 712 approximately 1/16" of one inch and include a total of three located equally at 120 degrees from each other. This allows for securing to the object for transport, such as a wooden leg of furniture without the need of a hammer or tools. While the penetration of the spikes 714 are advantageously designed in size and configuration to eliminate the need for tools, the spikes' 714 design and configuration in combination with the adhesive bond of the engagement surface 712 provide sufficient strength to resist separation after attachment, shear stresses, or failure during transport of the object.

In the illustrated example embodiment of FIGS. 29-35, the adhesive engagement surface 712 and metal fixture 760 are secured to the upper side 709 of the support plate 708. The support plate 708 is moveably secured (in the direction of arrows Y in FIG. 34) to the annular wiper 702 through the molded bellows 704 connection. An adhesive connection 725 connects a diametrical central post 728 of the of the support plate 708/wiper 702 to the transport surface 706.

The dynamic wear system 790 formed in part by the bellows 704, allows for the vertical movement or translation of the support plate 708 and transport surface 706, as indicated by arrows Y. The bellows 704 are molded into the plastic support plate 708 between the annular wiper 702 and plate and include a number of undulation about the periphery of the plate and wiper. The bellows 704 absorb energy, creating the lesser secondary load 703 relative to the primary load 701 carried by the transport surface 706, thus preventing marking while contacting the floor and eliminating the collection of debris on the transport surface.

During use, the weight of the object acting down on the repel assembly 700 (as indicated by the arrow F in FIG. 27) causes the downward movement or translation of the support plate 708 and its bellows 704 as described above, and accordingly, the movement of the support plate diametrical center post 728. The center post 728 thereby engages in its entirety and substantially uniformly, the transport surface 706, thus advancing the transport surface (706' shown in phantom) out of an opening 734 in the bottom of the annular wiper 702. The lesser, secondary load 703 originated by the object is reduced and absorbed by the bellows 704 before being applied to the annular wiper 702. This prevents the annular wiper 702 from

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marring or marking the floor, yet it remains in contact with the floor to prevent dust and debris from collecting on the transport surface **706**.

The dual loading nature of the primary load **701** and secondary load **703** of the dynamic wear system **790**, advantageously prevents collection of dirt, dust, hair, and debris from collecting to or near the transport surface **706**, while preventing the floor from being damaged over time even as the material **741** wears away from the transport surface. Stated another way, the repel assembly **700** includes the dynamic wear system **790** that allows the transport surface **706** to remain in primary contact with the floor under the greatest load over time, while the annular wiper **702** remains at a safe cleaning contact load with the floor that does not allow for marking or scratches, but keeps the transport surface safe from debris. In another example embodiment, the transport surface **706** includes a wear indicator **742** that informs the user that the amount of material worn from the bottom of the transport surface is no longer sufficient to provide protection to the floor.

FIGS. **36-44** illustrate a repel assembly **800** constructed in accordance with another example embodiment of the present disclosure. The repel assembly **800** includes a dynamic wear system **890** that allows the transport surface to remain in primary contact with the floor based on the load provided by the object resting upon the assembly, while a lesser, secondary load from the object is applied to an annular wiper that prevents debris from collecting on transport surface. The dynamic wear system **890** in addition, prevents the repel assembly from marking the floor while also facilitating the annular wiper's ability to maintain constant contact with the floor, thus preventing the collection of dust or debris on the transport surface during use. The repel assembly **800** includes an annular wiper **802**, transport surface **806**, contact member **808**, support plate **809**, plurality of spikes **810**, and engagement surface **812**.

In the illustrated example embodiment, the annular wiper **802** is integrally molded into or with the support plate **809**, and both are made from plastic. In one example embodiment, the support plate **809** and annular wiper are made from low density polyethylene (LDPE). The annular wiper **802** engages the floor with a secondary load represented by F_{y1} , F_{y2} , **803** (in FIGS. **42-43**), while in contact with the floor, allowing it to act as a dust cover, repelling debris from attracting to the transport surface **806**.

The repel assembly's **800** engagement surface **812** includes a plurality of spikes **810** for attaching to an object such as furniture, or the bottom of a leg, chair, ottoman, dresser, and the like. That is, the repel assembly **800** is fixedly attached to form a secured connection to an object (not shown) such as a furniture leg through the combination of an adhesive bond **816** located on the engagement surface **812** of the contact member **808** and plurality of attachment spikes **810** fixed or molded into the support plate **809** and projecting away from the engagement surface. In the illustrated example embodiment, the plurality of spikes are over-molded into the support plate **809**.

The transport surface **806** in the illustrated example embodiment is made from a cushion-like material, such as foam or felt that contacts the floor on which the object is located. The transport surface **806** is located below the support plate **809**, which advances the transport surface under a primary load represented by F_1 , F_2 , and **801** (in FIGS. **42-44**) carried by the object out of an annular opening **834**. In one example embodiment, the bottom and top surfaces of the support plate **809** that engage the transport surface **806** and contact member **808**, respectively are textured in the mold in

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order to reduce movement of the surface and member. It should be appreciated by those skilled in the art that the transport surface **806** can either be press-fit into the annular opening **834** of the surface plate **809** and/or secured by an adhesive with the surface plate. Alternatively, the transport surface can be molded or hot melted into the surface plate in order to make a securing connection.

Because the primary load F_1 , F_2 , **801** generated by the object is axially transferred (see reference character Y in FIGS. **43** and **44**) onto and taken up by the transport surface, the primary load is greater than the secondary load **803** applied to the annular wiper **802**. The secondary load **803** applied to the annular wiper **802** is also less than the primary load **801** because of the reduced normal component F_y (see FIGS. **43** and **44**) and as a result of the construction of the annular wiper, thus marking or scratching of the floor is avoided, as well as the reduction of dust and debris from collecting on the transport surface **806** common to felt furniture glides. This prevention of scratches or marks on the floor and is achieved by the repel assembly's dynamic wear system **890**.

The reduction in the collection of debris on the transport surface **806** attributed to the annular wiper **802** construction is best seen in FIGS. **42-44**. The annular wiper includes a cover or arm **805**, extending from the support plate **809** at a first end **807** to a second end **811**, which maintains constant contact with the ground or floor during loading and wear overtime. The second end **811** includes a lip **813** that prevents the wiper **802** from catching or snagging on imperfections found in the floor. In one example embodiment the lip **813** includes a radius, while in another example embodiment it is sharp pointed end as illustrated in FIG. **50**.

The cantilevered extension of the annular arm **805** from the support plate, the reduction of the primary load **801** to a secondary load **803** on the arm, and the arm's reduced thickness or tapered construction shown in the arm from the first end **807** to the second end **811**, advantageously allows the wiper **802** to maintain 360 degrees of contact with the floor during loading or wear of the transport surface **806** (as the felt or material is compressed with time). This contact is maintained even with the legs left on the floor when the object is tilted. That is, an object is tilted when less than all legs remain on the floor.

It can be seen in FIGS. **42-44** that as wear or greater loading occurs in the axial direction Y, the arm **805** continues to stretch or rotate radially outward in the direction of arrow R, while maintaining constant 360 degree contact with the floor. This is contrasted with an arm **899** of uniform thickness illustrated in FIGS. **51-53** that in testing proved to inadequately maintain contact with the ground as the load or wear increased as shown between FIGS. **52** and **53**. The distance F increased between the ground and annular arm as illustrated in FIGS. **52** and **53** with an increase in object load or wear of felt on the transport surface **806**. In addition, the second end of the arm had a tendency to undesirably curl as indicated by reference character C and collect debris in dust on top at D1 and below D2 of the arm when a uniform arm thickness was tested.

In the illustrated example embodiment of FIGS. **36-44**, the overall diameter of the annular wiper **802** is one inch to one and one half inches in diameter. The thickness "t" of the annular arm **805** at the first end **807** is approximately 0.018" inches, while the thickness "t" of the annular arm **805** tapered to approximately three times that of the first end, that is, a thickness of 0.050" inches was found to be a suitable taper. In the same example embodiment, the felt or transport surface had a diameter of approximately 1" one inch. It should be

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appreciated by those skilled in the art that other sizes of proportionally scaled dimensions are intended to be within the scope and spirit of the claimed disclosure.

The dynamic wear system **890** generated by the primary and secondary loads, protect the floor from marring or damage during movement of the object across the surface of the floor. The secondary load imposed on the annular wiper **802** at a lesser amount since cantilevered arm **805** acts as a shock absorber, reducing the loading force on the annular wiper by component force F_{x1} and/or F_{x2} of the secondary force **803**, illustrated in FIGS. **43** and **44**, thus preventing marking or scratches to the floor.

In the illustrated example embodiment, the engagement surface **812**, transport surface **806**, support plate **809**, and annular wiper **802** are circularly shaped, but could be constructed to include any geometrical shape to match the geometry profile of the object in which the repel assembly **800** is secured without departing from the spirit and scope of the present disclosure.

Illustrated in FIGS. **38-40**, are the top, side elevation, and bottom plan views of the example embodiment of FIG. **36**. In the illustrated example embodiment, except for the metal spikes **810**, transport surface **806**, and adhesive **816**, the entire assembly **800** is formed from plastic, such as LDPE. In one example embodiment, the transport surface **806** is felt, a polymer such as polyethylene or polypropylene, or foam material, capable of preventing marring or marking of the floor during use.

In one example embodiment, a metal fixture **860** forming the plurality of attachment spikes **810** is seated into a form or fixture (not shown) in the top of the support plate **809**. While in an alternative example embodiment, the metal spikes **810** along with the metal fixture **860** is over-molded into the support plate **809**. It should be appreciated that while 3 separate spikes are shown in the plurality of spikes **810**, the plurality of spikes could be reduced to a single spike or more than three spikes without departing from the spirit and scope of the present disclosure.

The engagement surface **812** comprises the double-sided adhesive **816**, allowing for adhesive bonding to both the object (not shown) and repel assembly **800**. In the illustrated example embodiment, the engagement surface **812** is approximately $\frac{1}{32}$ " of one-inch thick and the upper side includes a protective sheet to cover the adhesive surface that is removed upon assembly or attachment to the object during use.

In addition to the adhesive bond formed by the double-sided adhesive **816**, the plurality of attachment spikes **810** penetrate the engagement surface **812** during assembly. This penetration assists in the securing of the engagement surface **812** to the object.

The plurality of attachment spikes **810** protrude from the attachment surface **812** approximately $\frac{1}{16}$ " of one inch and include a total of three located equally positioned radially at 120 degrees from each other. This allows for securing to the object for transport, such as a wooden leg of furniture with the use of a small hammer or equivalent tool. While the penetration of the spikes **814** are advantageously designed in size and configuration in combination with the adhesive bond of the engagement surface **812** provide sufficient strength to resist separation after attachment, shear stresses, or failure during transport of the object.

In the illustrated example embodiment of FIGS. **36-41**, the adhesive engagement surface **812** and metal fixture **860** are secured to the upper side **819** of the support plate **809**. The metal fixture **860** in the example embodiment of FIG. **41** is

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molded into the support plate **809** along with the annular wiper when the repel assembly is formed.

The dynamic wear system **890** formed by the annular wiper **802** and its tapered **805** thickness, allows for the horizontal movement or translation of the annular tapered arm when the support plate **808** and transport surface **806** translate vertically by the primary load **801**, as indicated by arrow Y in FIGS. **43** and **44**. The annular wiper **802** absorbs energy, creating the lesser secondary load **803** relative to the primary load **801** carried primarily by the transport surface **806**, thus preventing marking while contacting the floor and eliminating the collection of debris on the transport surface. The primary load energy absorption occurs as a result of the vector components formed by F_x and F_y in FIGS. **43** and **44**, as well as, the tapered thickness in the arm. Thus, the annular wiper receives a lesser or secondary **803** load that is smaller than the primary load **801** formed by the object on the repel assembly **800**. This lesser load **803** is small enough to prevent marking on the floor or surface in contact with the repel assembly **800**, but great enough to result in constant contact around the wiper perimeter, thus repel dust and/or debris from contacting or accumulating on the transport surface **806**.

During use, the weight of the object acting down on the repel assembly **800** (as indicated by the arrow F_1 and F_2 in FIGS. **43** and **44**) causes the downward movement or translation of the support plate **809**, the transport surface **806**, and the wiper **802** as described above, and accordingly, the rotational movement at the first end **807** of the arm **805** allows at the second end **811** to maintain constant contact along the floor or ground. The lesser, secondary load **803** originated by the object is reduced and absorbed by the tapered arm **805**, as discussed above. This prevents the annular wiper **802** from marring or marking the floor, yet it remains in contact with the floor to prevent dust and debris from collecting on the transport surface **806**.

The dual loading nature of the primary load **801** and secondary load **803** of the dynamic wear system **890**, advantageously prevents collection of dirt, dust, hair, and debris from collecting to or near the transport surface **806**, while preventing the floor from being damaged over time even as the material **841** wears away from the transport surface. Stated another way, the repel assembly **800** includes the dynamic wear system **890** that allows the transport surface **806** to remain in primary contact with the floor under the greatest load over time, while the annular wiper **802** remains at a safe cleaning contact load with the floor that does not allow for marking or scratches, but keeps the transport surface safe from debris. In another example embodiment, the transport surface **806** includes a wear indicator **842** that informs the user that the amount of material worn from the bottom of the transport surface is no longer sufficient to provide protection to the floor.

Illustrated in FIGS. **45-50** is another example embodiment of the repel assembly **800** similarly constructed as the example embodiment of FIGS. **36-44**, except, the example embodiment is without a plurality of cleats **810**. Instead, the example embodiment of FIGS. **45-50** is a held to an object solely by adhesive layer **816** on the contact surface **808**. In one example embodiment, the adhesive layer is double-sided tape.

While many of the above example embodiments have been described as having both spikes and adhesive connections with the object it should be appreciated by those skilled in the art that either spikes or adhesive connections can be used exclusively to connect with the object without departing from the spirit and scope of the claimed disclosure.

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What have been described above are examples of the present invention. It is of course, not possible to describe every conceivable combination of components or methodologies for purposes of describing the present invention, but one of ordinary skill in the art will recognize that many further combinations and permutations of the present invention are possible. Accordingly, the present invention is intended to embrace all such alterations, modifications, and variations that fall within the spirit and scope of the appended claims.

What is claimed is:

1. An assembly for repelling or preventing the collection of debris at the base of an object, the assembly comprising:

a support plate having upper and lower regions, the upper region supporting an engagement surface having an adhesive plane for securing to the object during use;

a transport surface positioned within an opening in said lower region of said support plate, the transport surface for making primary contact with the floor for carrying a first portion of a load of the object during use; and

an annular wiper having first and second annular ends to form an annular arm having a uniform thickness along its entire length, the first end being integrally connected to said support plate and the second annular end extending from said first annular end, the annular wiper repelling and preventing debris from contacting and collecting on said transport surface.

2. The repel assembly of claim 1 wherein said repel assembly is molded with an attachment glider on the object.

3. The repel assembly of claim 1 further comprising an adhesive for securing said repel assembly to an attachment glider on the object.

4. The repel assembly of claim 1 wherein said second end further comprises a radial annular end, facilitating the repelling features of the repel assembly.

5. The repel assembly of claim 1 wherein said transport surface further comprises a contact end, the annular wiper and said transport surface being assembled such that said contact end is substantially parallel with an annular surface of said second end during use of the repel assembly.

6. The repel assembly of claim 1 wherein said transport surface is formed from a compressible material.

7. The repel assembly claim 6 wherein said compressible material forming said transport surface is compressed during use such that an annular surface of said second end is substantially parallel with a contact end of said transport surface.

8. The assembly of claim 1 wherein said second annular end comprise a sharp pointed annular end.

9. The assembly of claim 1 further comprising an adhesive member having adhesive bonding first and second sides, the first adhesive bonding side fixedly attached with said adhesive plane and said second adhesive bonding side to secure to the object during use.

10. The assembly of claim 1 further comprising a plurality of attachment spikes extending from said support plate to secure the assembly to the object during use.

11. The, assembly of claim 1 wherein said annular wiper is formed from low density polyethylene.

12. A method for repelling or preventing the collection of debris at the base of an object, the method comprising the steps of:

providing a support plate having upper and lower regions, the upper region supporting an engagement surface having an adhesive plane for securing to the object;

positioning a transport surface within an opening in said lower region of said support plate, the transport surface

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for making primary contact with a floor for carrying a first portion of a load of the object during use; and integrally connecting by molding an annular wiper having first and second annular ends to form an annular arm to said support plate, the annular arm having a uniform thickness along its entire length, the second annular end extending from said first annular end, the annular wiper repelling and preventing debris from contacting and collecting on said transport surface.

13. The method of claim 12 further comprising securing the assembly to the object during use with a plurality of attachment spikes extending from said support plate.

14. An assembly for repelling or preventing the collection of debris at the base of an object, the assembly comprising:

a contact member having an engagement surface with a securing device for securing to the object during use;

a support plate having top and bottom surfaces, the top surface supporting the contact member;

a transport surface positioned within an opening in said bottom surface of said support plate, the transport surface for making primary contact with a floor for carrying a first portion of a load of the object during use; and

an annular wiper having first and second annular ends to form an annular arm having a uniform thickness along its entire length, the first end being integrally connected to said support plate and the second annular end extending from said first annular end, the annular wiper repelling and preventing debris from contacting and collecting on said transport surface, a sealing lip further extending from said second annular end.

15. The assembly of claim 14 wherein the securing device includes an adhesive disposed on the engagement surface of the contact member.

16. The assembly of claim 14 wherein the contact member further includes a second surface with an adhesive for securing to the top surface of the support plate.

17. The assembly of claim 14 wherein the sealing lip repels and prevents debris from contacting and collecting on said transport surface.

18. The assembly of claim 14 further comprising a plurality of attachment spikes extending from said support plate to secure the assembly to the object during use.

19. The assembly of claim 14 wherein said annular wiper is formed from low density polyethylene.

20. The repel assembly of claim 14 wherein said repel assembly is molded with an attachment glider on the object.

21. The repel assembly of claim 14 further comprising an adhesive for securing said repel assembly to an attachment glider on the object.

22. The assembly of claim 14 wherein said sealing lip facilitates the repelling features of the assembly.

23. The assembly of claim 14 wherein said transport surface further comprises a contact end, the annular wiper and said transport surface being assembled such that said contact end is substantially parallel with an annular surface of said second end during use of the assembly.

24. The repel assembly of claim 14 wherein said transport surface is formed from a compressible material.

25. The repel assembly of claim 14 wherein said compressible material forming said transport surface is compressed during use such that an annular surface of said second end is substantially parallel with a portion of said transport surface making primary contact with the floor.

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